

TN  
682  
W4

UC-NRLF



\$B 77 947

Bibliographic Series

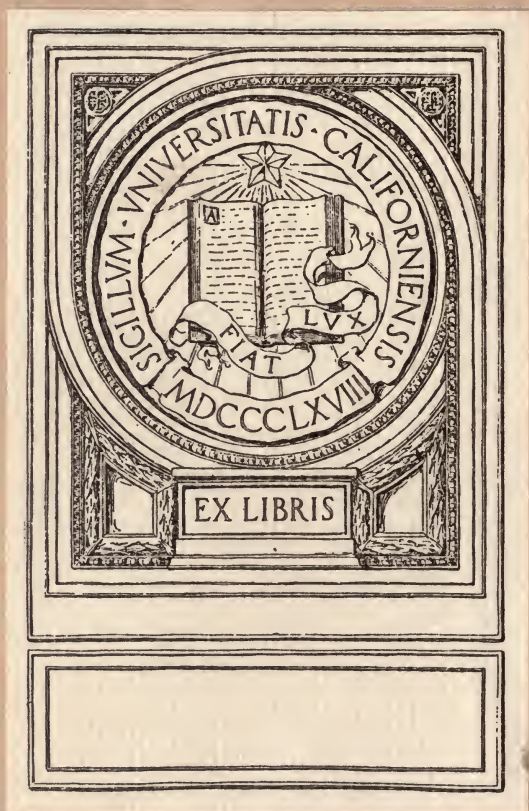
No. 4

# The Electric Furnace as Applied to Metallurgy

ARTHUR D. LITTLE, Inc.  
CHEMISTS AND ENGINEERS  
Cambridge, Mass.



Reprinted from Trans. Am. Electrochem. Soc.  
Vol. 37, 1920





T11382  
p29

*A paper to be presented at the Thirty-seventh General Meeting of the American Electrochemical Society, to be held in Boston, April 8-10, 1920.*

LIBRARY OF  
CALIFORNIA

## THE ELECTRIC FURNACE AS APPLIED TO METALLURGY.<sup>1</sup>

A READING LIST, 1900-1919.

By CLARENCE JAY WEST.<sup>2</sup>

The following pages contain a list of magazine references on the construction and operation of the electric furnace as applied to the metallurgy of iron and steel and the non-ferrous metals. An attempt has been made to include all the important references since 1900, at which time the electric furnace was becoming established in the iron and steel industry. Since 1907 the reference to Chemical Abstracts is given in addition to the magazine references, since this source will enable the reader to eliminate many of the references here given as unsuitable for his particular needs.

Criticism of the arrangement of this work is cordially invited, since we desire to make such studies of the greatest value to all interested.

### GENERAL.

Acid electric furnace process. *Iron Age* **93**, 670-672 (March 12, 1914).

Adler, E., and Sabersky, E. New electrical hardening furnace. *Trans. Faraday Soc.* **5**, 15 (1909).

Automatic control for high rated electric furnaces. *Elec. W.* **71**, 699 (1918); *C. A.* **12**, 1267.

Automatic furnace temperature control. *Iron Age* **99**, 546 (1917); *C. A.* **11**, 1062.

Badger, W. L. A switchboard for experimental electric furnace work. *Trans. Am. Electrochem. Soc.* **31**, 157-164 (1917); *C. A.* **11**, 1791.

<sup>1</sup> Manuscript received February 9, 1920.

<sup>2</sup> Information Department, Arthur D. Little, Inc., Cambridge, Mass.



- Baily, T. F. An electric furnace for heating bars and billets. *Trans. Am. Electrochem. Soc.* **19**, 285 (1911); **21**, 419 (1912); *Iron Age* **87**, 1094-7 (May 4, 1911); *C. A.* **5**, 3377.  
Data on the operation of electric furnaces. *Elec. W.* **71**, 780-781 (1918).  
Electric furnaces for reheating, heat treatment and annealing. *Eng. Soc. W. Pa. Proc.* **31**, 255-72, 272-283 (1915); *Met. Chem. Eng.* **13**, 558-64 (1915); *C. A.* **9**, 2736; *Ry. Age* **89**, 481-2; *Mech. Eng.* **37**, 415-16; *Iron Trade R.* **57**, 405 (1915).  
Electric furnaces of the resistance type used in the production of essential war materials. *Trans. Am. Electrochem. Soc.* **35**, 411-414 (1919); *C. A.* **13**, 931.  
Electricity for heat treatment in the steel industry. *Elec. Rev.* **75**, 149-54 (1919); *C. A.* **13**, 2159.  
Heat treatment in automatic electric furnaces. *Iron Age* **96**, 993-995 (1915); *Iron Trade Rev.* **57**, 833-856 (1915).  
Baily automatic electric furnace for heat treating shells. *Met. Chem. Eng.* **18**, 156 (1918); *C. A.* **12**, 651.  
Bartlett, C. W. Commercial application of resistance furnaces. *Elec. W.* **65**, 1526-7 (1915); *C. A.* **10**, 16.  
Beckman, J. W. Electrolytic furnace method for producing metals. *Trans. Am. Electrochem. Soc.* **19**, 171 (1911); *Chem. Eng.* **13**, 158; *C. A.* **5**, 2467.  
Benner, R. C. An electric laboratory furnace. *J. Ind. Eng. Chem.* **4**, 43 (1912); *C. A.* **6**, 713.  
Bennie, P. M. Electric furnace, its place in siderurgy. *Eng. Soc. W. Penn., Proc.* **26**, 487 (1910); *C. A.* **5**, 3197; *J. Can. Min. Inst.* **13**, 135-150 (1910); *Iron Age* **85**, 216-218 (1910).  
Electric smelting in the foundry. *Electrochem. Met. Eng.* **5**, 75-76 (1907); *C. A.* **1**, 1381.  
Bibby, J. Electric furnace developments. *Iron Coal Trades Rev.* **97**, 719-722 (Dec. 27, 1918).  
Bolling, F. Resistance materials for electrical furnaces. *Elektrochem. Z.* **17**, 331-333; *C. A.* **5**, 3654.  
Booth, Carl H. The Booth electric rotating furnace. *Chem. Met. Eng.* **21**, 636-638 (Nov. 12-19, 1919).

- Booth, W. K. Booth-Hall electric furnace. *Iron Coal Trades Rev.* **98**, 617 (May 9, 1919); *Can. Machy.* **21**, 430-433 (May 1, 1919); *Can. Foundryman* **10**, 142-145 (June, 1919).
- Borchers, W. Electric crucible furnace for melting and pouring metals. *Metallurgie* **8**, 209-211; *C. A.* **5**, 3197.
- Electric smelting with the Girod furnace. *Eng. Min. J.* **88**, 1113-7 (1909); *Mining J.* **87**, 269-74 (Nov. 13, 1909); *C. A.* **4**, 1427.
- Electric smelting with the Girod furnaces. *Elec. Eng.*, May 6, 1910; *Oesterr. Z. Berg. Hüttenw.* **58**, 149-152, 163-167, 182-6 (Mar. 19, 1910); *Trans. Am. Inst. Min. Eng.* **41**, 120 (1910).
- Electric furnace for the separation and refining of metals. *Z. Elektrochem.* **3**, 189-192, 213-222, 239-244, 260-264 (Nov. 5, 1896).
- Girod furnace. *Elec. Eng. (L.)*, May 6, 1910.
- Reducing fusion of oxide ores in the electric furnace. *Metallurgie* **8**, 246-248; *C. A.* **5**, 3197.
- Borns, H. Electrochemistry in the year 1909. *Chem. Ind.* **33**, 527-40, 578-88, 638-47, 671-83; *C. A.* **5**, 428.
- Bragg, C. T. The future of the electric furnace. *Can. Chem. J.* **3**, 334 (1919); *C. A.* **14**, 16.
- Brezol, C. H. A small oscillating fusion furnace for voltaic arc and heating of combustible compounds. *J. four elec.* **28**, 30 (1919); *C. A.* **13**, 1045.
- Brisker, C. Theoretical and practical importance of the electric blast furnace. *Rev. métal.* **7**, 1046-1047; *C. A.* **5**, 2032; *Stahl u. Eisen* **30**, 1049-55 (1910).
- Brown, O. W. Reduction of metal sulfides. *Trans. Am. Electrochem. Soc.* **9**, 190 (1906).
- Burgess, C. F. Present status of electric furnace working. *J. West. Soc. Engineers* **10**, 16 (1905).
- Catani, R. Applications of electricity in the metallurgical industry in Italy. *Electrician* **68**, 429; *Elec. Rev. West. Elec.* **59**, 893; *Met. Chem. Eng.* **9**, 642-649 (1911); *J. Iron Steel Inst.* **84**, 215 (1911); *C. A.* **6**, 563; *Iron Coal Trades Rev.*, Oct. 6, 1911.
- Electric induction furnace. *Industrie*, Dec. 4, 1910; *Ann. Soc. Ing. Arch. Ital.*, Feb. 16, 1911.

- Electro-siderurgy and railway materials. *Ann. Soc. Ing. Arch. Ital.*, July 15, 1911.
- Charpy, G. Electric furnace of the Saint Jacques works (de Monluçon). *Rev. métal.* **8**, 305-311; *C. A.* **5**, 2778.
- Clamer, G. H. Ajax-Wyatt electric furnace. *Metal Ind.* **17**, 362-363 (1919); *C. A.* **13**, 399, 2311.
- Clark, A. M. New type electric furnace. *Iron Age* **103**, 1502 (1919); *C. A.* **13**, 1972.
- Clark, E. B. Electric furnace in the foundry. *Iron Age* **98**, 615-6 (1916); *C. A.* **10**, 2841.
- Clerc, L. and Minet, A. New form of electric arc furnace, suitable for laboratory research. *Compt. rend.* **146**, 227; *Mon. sci.* **22**, 154; *C. A.* **2**, 1218.
- Researches on the electric furnace. *Elektrochem. Z.* **15**, 97-100; *C. A.* **2**, 3196.
- Collens, Clarence L. Some principles of resistor furnace design. *Trans. Am. Electrochem. Soc.* **9**, 31-62 (1906); *C. A.* **1**, 11.
- Collins, E. F. Metal melting in electric furnaces. *Metal Ind.* **17**, 221-224 (May, 1919).
- Combes, Ch. The Froges-Heroult electro-metallurgical process. *L'Electrochimie*, Dec., 1904.
- Comparison between electric and fuel furnaces. *Met. Chem. Eng.* **11**, 652 (1913).
- Comstock, G. F. Copper castings for electrical purposes. *Trans. Am. Electrochem. Soc.* **32**, 221-227 (1917); *C. A.* **12**, 22.
- Conklin, H. R. Electric furnace at Lluvia de Oro. *Eng. Min. J.* **93**, 1189-1192; *C. A.* **6**, 2579.
- Conrad, W. Intensity and tension of the currents in electric furnaces. *Rev. métal.* **7**, 1059-1060; *C. A.* **5**, 2218.
- Crocker, F. B. and Arendt, M. Electrochemical industries. *School of Mines Quarterly* **25**, 1-20 (1903).
- Crosby, E. L. The electric furnace and central station. *Iron Age* **100**, 1356-7 (1917).
- The present status of the electric furnace. *Sales Managers' Assn.* 1914; *C. A.* **8**, 3645.



- Crowley, J. A. Grönwall Dixon electric furnace. *Iron Trade Rev.* **59**, 571-3; *Iron Age* **98**, 517-20 (1916); *Foundry* **44**, 497-9 (1916).
- Culls, V. O. Baily electric furnace. *Electrician* **83**, 405 (1919); *C. A.* **14**, 19.
- Darling, C. R. High temperature processes and products. *J. Roy. Soc. Arts* **66**, 621, 635, 649 (1918); *C. A.* **12**, 2478.
- Davy, G. The Gin electric furnace. *L'Electricien* **30**, 305-309 (Nov. 11, 1905).
- Development of the electric furnace. *Rivista tecnica d. ferr. Ital.* **10**, 49-50 (1917); *C. A.* **11**, 2070.
- Dewey, F. P. History of electric heating applied to metallurgy. *Elec. Rev.* **28**, 160-161, 168, 193, 210 (1896).
- Dillen, H. E. New duplexing process is invented. *Foundry* **47**, 662-665 (Sept. 15, 1919).
- Doremus, C. A. Robert Hare's electric furnace. *Electrochem. Met. Ind.* **6**, 235 (1908); *C. A.* **2**, 2507.
- Dushman, S. Electrochemical and electrometallurgical developments in Canada. *Appl. Sci.* **5**, n. s., 29-36, 39-54 (Nov., Dec., 1911); *Trans. Am. Electrochem. Soc.* **20**, 419 (1911).
- Easlick, S. P. Present position of the electric furnace for the smelting of metalliferous ores. *Mining J.* **93**, 321-323 (Apr. 1, 1911).
- Effect of conductor arrangement upon input to electric furnace. *Elec. Rev.* **75**, 668 (1919); *C. A.* **13**, 3084.
- Electric crucible furnace for high temperatures. *Chem. Ztg.* **36**, 1263; *C. A.* **7**, 729.
- Electric furnace. *Elec. W.* **63**, 1508 (1914); *Met. Chem. Eng.* **12**, 483 (1914); *C. A.* **8**, 2848.
- Electric furnace and method of operation. *Foundry* **42**, 17-18 (1914).
- Electric furnace developments for metals. *Metal Ind.* **17**, 424-427 (1919); *C. A.* **13**, 3083.
- Electric furnace operations at Buffalo. *Elec. W.* **73**, 1378-1381 (1919).
- Electric furnaces. *Elec. W.* **52**, 990 (1908); *C. A.* **3**, 27.
- Electric furnaces at Essen. *Elec. Rev. West. Elec.* **61**, 414; *C. A.* **6**, 3058.

- Electric furnaces at the University of Illinois. *Elec. Rev. West. Elec.* **58**, 628; *C. A.* **5**, 1872.
- Electric furnaces in Italy. *Elec. Rev. West. Elec.* **21**, 295-296 (1915); *C. A.* **10**, 16; *C. A.* **12**, 1855.
- Electric furnaces in metallurgy. *Electrician* **81**, 588-590 (Nov. 15, 1918).
- Electric furnaces in metallurgy. The Greaves-Etchells furnace. *Electrician* **83**, 438-440 (1919); *C. A.* **14**, 152.
- Electric hardening furnace. *Iron Age* **92**, 174 (1913); *C. A.* **7**, 3275.
- Electric induction furnaces. *Elektrochem. Z.* **15**, 14-16, 43-46, 65-67 (1908).
- Electric melting practice. *Iron Age* **94**, 689-690 (1914).
- Electric transformer crucible furnace. *Met. Chem. Eng.* **10**, 501 (1912); *C. A.* **6**, 2890.
- Electrical apparatus development. *Elec. W.* **73**, 1102-1105 (May 24, 1919).
- Electrically heated oxide furnace on the step principle. *Engineering* **84**, 497-8; *C. A.* **2**, 629.
- Electrochemical and electrometallurgical industries of Italy. *J. four elec.* **27**, 129-30 (1918); *C. A.* **12**, 1614.
- Electrochemical industries at Niagara Falls. Lecture by Fitzgerald. *Electrochem. Met. Ind.* **3**, 253-5 (1905).
- Electrochemical and related apparatus in 1917. *Elec. Rev. West. Elec.* **72**, 48 (1918); *C. A.* **12**, 332.
- Electrochemistry and electrometallurgy. *Elec. Rev.* **74**, 9-10 (1919); *C. A.* **13**, 283.
- Electrometallurgical and electrosiderurgical plant at Ugine, Savoy. *Tech. Mod.*, Feb. 1, 1912.
- Electrometallurgical industries in the Scandinavian countries. *J. four elec.* **28**, 17-19 (Feb. 1, 1919).
- Electrometallurgy in Sweden. *J. four elec.* **27**, 148-9 (1918); *C. A.* **12**, 1614.
- Electro- and organic chemical industries of Russia. *Chem. Trade J.* **59**, 263-4 (1916); *C. A.* **10**, 2843.
- Elliott, G. K. Electric furnace an adjunct to cupola. *Foundry* **47**, 687 (1919); *Iron Trade Rev.* **65**, 891-892 (1919).

- Employment of electric furnace in foundry work. *Fonderie Moderne* **2**, 266-267 (Feb., 1919).
- Energy consumption and other data on electric furnaces. *Iron Age* **100**, 1048 (Nov. 1, 1917).
- Engelhardt, V. Electric induction furnaces. *Elektrotech. Z.* **28**, 1051-1053, 1084-1089, 1104-1108, 1124-1128 (1907).
- Escard, J. A technical description of industrial electric furnaces. *Rev. gén. elec.* **4**, 575-91 (1918) *C. A.* **13**, 930.
- The electric furnace and its application in the manufacture of industrial products. *L'industrie chimique* **5**, 214, 253, 284, 351 (1918); **6**, 8-12 (1919); *C. A.* **13**, 930.
- The preparation in the electric furnace of some metals of industrial application. *Rev. gén. elec.* **4**, 375-386 (1918); *C. A.* **13**, 930.
- Technical analysis of industrial electric furnaces. *Rev. gén. elec.* **4**, 575-591 (Oct. 19, 1918).
- Experimental electric furnace plant. *Brass World* **9**, 353-357 (Oct., 1913).
- Experiments with a Girod steel furnace. *Engineering* **93**, 245-246 (Feb. 23, 1912).
- Fahrenwald, A. W. Convenient and inexpensive electric furnace for high temperatures. *Met. Chem. Eng.* **16**, 565-566 (1917); *C. A.* **11**, 2432.
- Farnworth, L. D. Experimental electric smelting. *Electrochem. Met. Ind.* **6**, 326 (1908).
- Farr, A. V. Electric furnace improvements during 1918. *Iron Trade Rev.* **64**, 211-5 (1919); *Blast Furnace and Steel Plant* **7**, 20-24 (1919); *C. A.* **13**, 813.
- Ferchland, P. Electrochemical patent specifications of the United States. *Monographien über angewandte Elektrochemie.* No. 33 (1910).
- English electrochemical patents. *Monographien über angewandte Elektrochemie.* No. 32 (1908).
- and Rehländer, P. German electrochemical patents. *Monographien über angewandte Elektrochemie.* No. 24 (1906).
- Ferguson, J. B. Temperature uniformity in a laboratory furnace. *Phys. Rev.* **12**, 81-94 (1918); *Chem. Met. Eng.* **20**, 283-8 (1918); *C. A.* **13**, 536.

- Fink, Colin G. Vacuum furnace metallurgy. *Trans. Am. Electrochem. Soc.* **21**, 445-461 (1912); *C. A.* **6**, 2713.
- FitzGerald, F. A. J. Economies of electric furnace operations. *Met. Chem. Eng.* **12**, 331-332 (1914); *Electrician*, Oct. 16, 1914.
- The electric furnace. *Proc. Am. Inst. E. E.* **31**, 875; *C. A.* **6**, 2207.
- The Borchers furnace. *Electrochem. Met. Ind.* **3**, 215-218 (1905).
- Electric furnace after the war. *Trans. Am. Electrochem. Soc.* **34**, 121-130 (1918); *Elec. Rev. West. Elect.* **73**, 726-7 (1918); *Chem. Met. Eng.* **19**, 611-612 (1918); *C. A.* **13**, 8.
- Electric furnace industry in 1903. *Electrochem. Ind.* **2**, 6-8 (1904).
- Experiments with an electrothermic muffle furnace. *Electrochem. Met. Ind.* **3**, 135-9 (1905).
- Heat losses in furnaces. *Trans. Am. Electrochem. Soc.* **21**, 535-544; **22**, 111-116 (1912); *Orig. Com. 8th Inter. Cong. Appl. Chem.* **21**, 37-41 (1912); *C. A.* **6**, 3058.
- Industrial resistance furnaces (Gin, Colby, Kjellin). *Electrochem. Met. Ind.* **3**, 296-299 (1905).
- Materials for resistors. *Electrochem. Ind.* **2**, 490-495 (1904).
- Miscellaneous accessories of resistance furnaces. *Electrochem. Met. Ind.* **3**, 9-14 (1905).
- New electric resistance furnace. *Trans. Am. Electrochem. Soc.* **19**, 273-284 (1911); *C. A.* **5**, 3198.
- New resistor furnace. *Met. Chem. Eng.* **8**, 317 (1910).
- Radiant resistor furnace. *Trans. Am. Electrochem. Soc.* **36**; *C. A.* **13**, 3083.
- Refractory materials in electrical resistance furnaces. *Electrochem. Ind.* **2**, 439-44 (1904).
- Resistance furnace for crucibles. *Electrochem. Met. Ind.* **3**, 55-58 (1905).
- Ruthenburg and Acheson furnaces. *Electrochem. Met. Ind.* **3**, 416-418 (1905).



- Some economics in the use of electric furnaces. *Trans. Am. Electrochem. Soc.* **25**, 53-58 (1914); *Met. Chem. Eng.* **12**, 331-332 (1914); *C. A.* **8**, 2112.
- Some first principles of electrical resistance furnaces. *Electrochem. Ind.* **2**, 342-345 (1904).
- Thirty years' progress in the electric furnace. *Mining Eng. World* **37**, 237-238 (1912); *Proc. Am. Inst. E. E.* (June, 1912); *C. A.* **6**, 3058.
- An unsuccessful furnace experiment. *Trans. Am. Electrochem. Soc.* **20**, 89, 281 (1911); *C. A.* **6**, 713.
- Fleming, J. A. Application of electric heating. *J. Roy. Soc. Arts.* **49**, 833, 857, 870, 886; *C. A.* **6**, 28.
- Electric furnaces and heating. *Met. Chem. Eng.* **9**, 234 (1911); *C. A.* **5**, 2219.
- Frank, K. G. Evolution of the electric furnace. *Iron Trade Rev.* **57**, 901-903 (1915).
- French commerce in electric furnace products in 1912. *Génie Civil* (June 21, 1913); *Lumière elec.* **23**, 67 (1913).
- Friedrich, K. Several new forms of electrically heated laboratory furnaces. *Metallurgie* **4**, 778-81; *C. A.* **2**, 1084.
- de Fries, H. A. and Hertenius, Jonas. Developments in the Rennerfelt furnace. *Eng. Ind. Management* **1**, 238-9 (Apr. 3, 1919); *Iron Age* **103**, 190-191 (1919).
- Galbraith electric furnace, The. *Elec. Eng. (London)*, July 21, 1905.
- Gallo, G. Present state of electrometallurgy. *Ann. Soc. Ing. Arch. Ital.*, Nov. 15, 1910.
- Gibson, C. B. The field of the electric furnace. *Elec. J.* **14**, 154-6 (1914); *C. A.* **11**, 1599.
- Gillett, H. W. and Rhoads, A. E. Development of electric melting furnaces. *Metal Ind.* **16**, 350-358 (1918).
- Gin, G. Mathematics of the induction furnace. *Trans. Am. Electrochem. Soc.* **12**, 97-115 (1907); *C. A.* **2**, 1526.
- Present state of electrochemistry. *Rev. gén. chim.* **12**, 39-46, 69-76; *C. A.* **3**, 1120.
- and Leleux. Study of the electric furnace. *Compt. rend.* **120**, 236-8 (Jan. 17, 1898).

- Girod furnace and smelting plant. *Stahl u. Eisen* **29**, 1942-1945 (Dec. 8, 1909).
- Girod Process, The. *Rev. d'electrochem.*, Jan., 1909.
- Gluckman, W. Notes on electric furnaces with special reference to an induction furnace. *Can. Eng.*, Nov. 20, 1913.
- Goecke, Otto. The electric vacuum furnace and its use. *Metallurgie* **8**, 667-676; *C. A.* **6**, 1401.
- Gosrow, R. C. Coke as a reducing agent in electric smelting furnaces. *Met. Chem. Eng.* **14**, 691-694 (1916); *C. A.* **10**, 2842.
- Design of electric furnaces. *Chem. Met. Eng.* **21**, 235-41 (1919); *C. A.* **13**, 3081.
- Electric furnace in the foundry. *Met. Chem. Eng.* **13**, 882-3 (1915).
- Gray, A. W. Production of temperature uniformity in an electric furnace. *Bureau of Standards Sci. Paper* 219, Feb. 3, 1914, 21 pp.
- Gray, J. H. Electric furnace construction and operation. *Foundry* **44**, 241-5, 274-6 (1916).
- The electric furnace in the foundry. *Iron Age* **96**, 798-800 (1915); *C. A.* **10**, 16.
- Greaves, H. A. Application of electrical energy to the melting of metals. *Electrician* **83**, 256-257 (Sept. 5, 1919); *Engineering* **108**, 42-3; *Eng. Ind. Management* **1**, 462-4 (1919); *C. A.* **13**, 2808.
- Greaves-Etchells electric furnace. *Elec. Rev.* **80**, 395-6 (Apr. 13, 1917).
- Green rolling cylinder arc furnace. *Iron Age* **103**, 1005-1007 (Apr. 17, 1919); *C. A.* **13**, 1281.
- Greenwood, H. C. and Hutton, R. S. Electric resistance furnace for melting in crucibles. *Proc. Inst. Metals, London* **17**, 237-242 (1917); *C. A.* **11**, 2431.
- Grier, C. D. The electric furnace laboratory of the Bureau of Mines. *Chem. Met. Eng.* **21**, 574-7 (1919).
- Griffiths, E. and E. C. A carbon tube furnace for testing the softening points and compression strengths of refractories. *Trans. Faraday Soc.* **12**, 207-19 (1917); *C. A.* **11**, 3403.

- Grigg, R. H. The electric furnace. *Brass World* **12**, 225-229 (Aug., 1916).
- Groeck, H. Electric blast furnace at Trollhattan. *Z. Ver. deut. Ing.* **56**, 195-196; *C. A.* **6**, 1096.
- Guillet, L. Electrometallurgy. *Tech. Mod.*, Mar., 1911.
- Haanel, E. The Frick electric reduction furnace. *Iron Trade Rev.* **47**, 835-839 (Nov. 3, 1910).
- Hadfield, R. Methods and appliances for the attainment of high temperatures in the laboratory. *Trans. Faraday Soc.* **12**, 1-12 (1917); *C. A.* **11**, 2992.
- Haff, Max. Removal of sulfur in the electric induction furnace. *Electrochem. Met. Ind.* **6**, 96-99 (1908); *C. A.* **2**, 1262.
- Hanemann, H. Electric furnace. *Z. Elektrochem.* **14**, 695-6; *C. A.* **3**, 286.
- Hanneel, E. Electric shaft furnace at Domnarfvet, Sweden. *Trans. Faraday Soc.* **5**, 306; *C. A.* **3**, 2906; **4**, 1427.
- Hansen, C. A. Small experimental Heroult furnace. *Electrochem. Met. Ind.* **7**, 206 (1909).
- Harbord, F. W. Electric smelting. *Elec. Eng.*, May 7, 1909. et al. Discussion on electric furnaces. *Electrician* **82**, 563-4 (1919); *C. A.* **13**, 1672.
- Harden, J. Effect of power factor and load factor in electric furnace work. *Electrician* **67**, 713 (1911); *C. A.* **5**, 3540.
- Electric furnace. *Electrician*, London, Mar. 18, 1910.
- Induction furnace developments. *Eng. Mag.* **45**, 97-100 (1913).
- Induction furnace notes. *Met. Chem. Eng.* **11**, 559-562 (1913).
- Paragon electric furnace. *Chem. Eng.* **13**, 80; *Met. Chem. Eng.* **9**, 595 (1911); *C. A.* **5**, 1560; *Electrician*, Nov. 3, 1911.
- Pinch effect and the pinch effect electric furnace. *Met. Chem. Ind.* **11**, 429-430 (1913); *C. A.* **7**, 3274.
- The pinch effect in electric furnaces of the induction type. *Electrochem. Met. Ind.* **7**, 478 (1909); *C. A.* **4**, 148.
- Present status of the induction furnace. *Met. Chem. Eng.* **11**, 99 (1913).
- Recent developments of induction furnaces. *Electrochem. Met. Ind.* **6**, 333-4 (1908); *C. A.* **2**, 2650.

- Recent developments of the Kjellin and Röchling-Rodenhäusen electric furnaces. *Iron Coal Trades Rev.*, June 26, 1908.
- Some electric furnace notes. *Met. Chem. Eng.* **9**, 130 (1911); *C. A.* **5**, 1710.
- and Vom Baur, C. H. Efficiency and refining possibilities of the induction furnace. *Met. Chem. Eng.* **12**, 216-217 (1914).
- Hässermann, C. Electric smelting furnace. *Z. Ver. Deut. Ing.*, Apr. 16, 1898.
- Hay, T. R. Electric furnace installation. *Iron Age* **101**, 735-7 (1918); *C. A.* **13**, 536.
- Possibilities of the electric furnace. *Elec. Rev. West. Elec.* **70**, 534-6, 575-7; *Elec. J.* **14**, 132-8 (1917); *C. A.* **11**, 1086, 1599.
- Helberger, H. Electric melting furnace with transformer. *Elektrochem. Z.* **16**, 5-8; *C. A.* **3**, 1618.
- Helberger electric transformer crucible furnace. *Brass World* **7**, 79-83 (1911); *C. A.* **5**, 1873.
- Helfenstein, A. Large electric furnace. *Elektrochem. Z.* **17**, 462; *C. A.* **5**, 3540.
- Large electric smelting furnace. *Elec. Rev. (London)* **125**, 379 (1914); *C. A.* **9**, 754.
- Helfenstein large electric furnace. *Iron Age* **91**, 1482-1484 (1913).
- Hering, Carl. Advantages of small high speed electric furnaces. *Met. Chem. Eng.* **11**, 183 (1913); *C. A.* **8**, 2159.
- Efficiencies of electric furnaces. *Met. Chem. Eng.* **9**, 125 (1911); *C. A.* **5**, 1711.
- Electric furnaces. *Elec. Rev. West. Elec.* **58**, 22; *C. A.* **5**, 831.
- Electric furnaces for molten materials. *Met. Chem. Eng.* **9**, 371-373 (1911); *J. Franklin Inst.* **172**, 55-72 (1911); *C. A.* **5**, 3198.
- Elementary principles of the design and operation of electric furnaces. *Met. Chem. Eng.* **8**, 471 (1910).
- Engineering features of electric furnaces. *Eng. Mag.* **42**, 540-548 (1912); *Eng. News* **62**, 56-60; *Proc. Eng. Club, Phila.* (Oct., 1911); *C. A.* **6**, 713.



- Flow of heat through bodies. *Met. Chem. Eng.* **9**, 652-4 (1911); *C. A.* **6**, 438.
- Formulas for pinch phenomenon. *Met. Chem. Eng.* **9**, 86 (1911); *C. A.* **5**, 1713.
- Heat conductance through walls of furnaces. *Trans. Am. Electrochem. Soc.* **14**, 215-238 (1908); *Electrochem. Met. Ind.* **6**, 495-499 (1908); *C. A.* **3**, 1247.
- Heat insulation of furnace walls. *Met. Chem. Eng.* **9**, 189-192 (Apr., 1911).
- Improving the output and efficiency of existing electric furnaces. *Met. Chem. Eng.* **8**, 276 (1910); *C. A.* **4**, 2768.
- Method of determining thermal conductivities. *Trans. Am. Electrochem. Soc.* **18**, 213 (1910); *C. A.* **5**, 1711.
- New type of electric furnace. *Elec. Rev. West. Elec.* **58**, 806; *Met. Chem. Eng.* **9**, 277 (1911); *C. A.* **5**, 2032; *Trans. Am. Electrochem. Soc.* **19**, 255-272 (1911).
- Physical versus chemical actions in furnaces. *Met. Chem. Eng.* **12**, 439-440 (1914).
- Pinch effect furnace. *Met. Chem. Eng.* **10**, 196 (1912); *C. A.* **6**, 3360.
- Possible reductions of the power consumption in electric steel refining furnaces. *Met. Chem. Eng.* **9**, 590-592 (1911); *C. A.* **6**, 190.
- Practical limitations of resistance furnaces. The pinch phenomenon. *Trans. Am. Electrochem. Soc.* **11**, 329-337 (1907); *C. A.* **2**, 23.
- Thermal insulation of furnace walls. *Met. Chem. Eng.* **10**, 97-102 (1912); *C. A.* **6**, 1570.
- Working limit in electrical furnaces due to the pinch phenomenon. *Trans. Am. Electrochem. Soc.* **15**, 255-278 (1909); *C. A.* **3**, 2408.
- Heroult, P. The Heroult furnace. *Electrochem. Met. Ind.* **5**, 411 (1907).
- Heroult furnace for foundry use. *Iron Trade Rev.* **56**, 976-978 (1915); *Foundry* **43**, 225-227 (1915).
- Heroult process, The. *Elektrochem. Z.* **12**, 125-27, 146-8, 168-70, 213-15, 232-35 (1905).
- Hill, F. E. and Fleming, A. P. M. Control of electric furnaces. *Trans. Faraday Soc.* **14**, 90-98 (1919); *C. A.* **13**, 1424.

- Hiorth, A. Design of a 30-ton induction electric furnace. *J. Ind. Eng. Chem.* **3**, 849-855 (1911); *C. A.* **6**, 191.
- Hirshfeld, C. F. Electrically heated core ovens. *J. Am. Inst. Metals* **11**, 240-249 (1917).
- Hollis, H. Service requirements of the electric furnace. *Elec. W.* **67**, 766 (1916); *C. A.* **10**, 1302.
- Hooper, Wm. Electric furnace and some of its applications. *Elec. J.* **6**, 221-234 (Apr., 1909).
- Horry, W. S. Power for electric furnace work. *Trans. Am. Electrochem. Soc.* **25**, 59-64 (1914); *Met. Chem. Eng.* **12**, 332-333 (1914); *C. A.* **8**, 2111.
- How electric furnaces are built. *Iron Trade Rev.* **64**, 1545-1548 (June 12, 1919).
- Hutton, R. S. and Petavel, J. E. Electric furnace reactions under high pressure. *Roy. Soc. London, Phil. Trans. (A)* **207**, 421-62 (1908); *Electrochem. Met. Ind.* **6**, 97 (1908); *Engineer.* **85**, 289 (1908); *C. A.* **2**, 1660; *Electrician*, July 31 (1908).
- Igeoski, B. Electric smelting furnace. *Engineering* **85**, 699-700 (1908); *C. A.* **2**, 2507.
- New electric furnace. *Rev. métal.* **5**, 38-47 (1908); *Chem. Ztg.* **32**, 506 (1908); *Electrochem. Met. Ind.* **6**, 296 (1908); *C. A.* **2**, 1117.
- Installations of Girod furnaces. *Eng. Min. J.* **93**, 420; *C. A.* **6**, 964.
- Jacobs, Chas. B. The electric furnace in industrial chemistry. *Trans. Am. Inst. E. E.* **19**, 295-308 (June, July, 1902).
- Jänecke, Ernst. A simple carbon-helix resistance furnace and a photographic temperature recording apparatus. *Z. Elektrochem.* **21**, 439-43 (1915); *C. A.* **10**, 853.
- Jeffries, Z. Notes on the gran-annular electrical furnace. *Met. Chem. Eng.* **12**, 154-7 (1914); *C. A.* **8**, 1389.
- Johnson, C. M. Improved laboratory furnace. *Iron Trade Rev.* **56**, 613-4 (1915); *C. A.* **9**, 1877.
- Johnson, W. McA. Electric furnace load for hydro-electric plants. *Elec. Rev. West. Elec.* **65**, 1028 (1914); *C. A.* **9**, 22.
- Off-peak loads and the electric furnace. *Elec. W.* **64**, 762 (1914); *C. A.* **9**, 22.

- Rotary electric furnace. *Electrochem. Met. Ind.* **4**, 321 (1906).
- Thermal efficiency of the electric furnace. *Eng. Soc. W. Penn.*, *Proc.* **31**, 488-498, 499-509 (1915); *Iron Trade Rev.* **57**, 491 (1915); *C. A.* **10**, 853.
- Water cooling of furnace. *Electrochem. Met. Ind.* **4**, 6 (1906). A letter.
- and Sieger, G. N. History of electric furnaces, their design, characteristics and commercial applications. *Met. Chem. Eng.* **11**, 504-7, 563-7, 643-8, 683-6 (1913); *C. A.* **7**, 3572; **8**, 298; *Met. Chem. Eng.* **12**, 41-43 (1914).
- Kameyama, N. The behavior of magnesia in the carbide furnace. *J. Chem. Ind. Japan* **19**, 41 (1916); *C. A.* **10**, 1008.
- Keeney, R. M. Electric smelting with special reference to Canadian conditions. *Can. Min. Inst. Bull.* **88**, 846-853 (Aug., 1919); *Col. School Mines Mag.* **9**, 219-222 (Aug., 1919).
- Electrical resistance furnace. *Eng. Mag.* **47**, 605-606 (1914).
- Keller, Albert. Application of the electric furnace to metallurgy. *Iron Coal Trades Rev.*, May 8, 1903.
- Keller, C. A. Study of the electric furnace. *Iron Age* **83**, 1753-59 (1909); *C. A.* **4**, 865.
- Keller electric furnace. *J. Mines Met.* **1**, 66-70, 85-86; *C. A.* **6**, 2207.
- Keller process for producing steel in the electric furnace. *Rev. d'electrochim.*, Dec., 1908.
- Kennedy, Walter C. Heroult electric furnace. *Assn. Iron Steel Elec. Eng.*, Sept., 1917.
- Kershaw, J. B. C. Applied electrometallurgy up to the end of 1906. *Eng. Mag.* **34**, 105-119, 261-277 (1907).
- Electric annealing furnaces for hardening and tempering high-class tools. *Elec. W.* **53**, 448-450; *Electrochem. Met. Ind.* **7**, 95 (1909); *C. A.* **3**, 863, 1493.
- Electrometallurgical industries in 1907. *Cassier's Mag.* **32**, 26-36 (1907).
- and London, F. J. C. The electrochemical and electrometallurgical industries of Great Britain. *Monographien über angewandte Elektrochemie.* No. 27 (1907):

- Kirkgasse, G. J. Electric heated industrial furnaces. *Ind. Management* **57**, 26-32 (Jan., 1919).
- Kjellin electric furnace, The. *Four électrique de M. Kjellin*, Juin, 1903.
- Klugh, B. G. Silicon manganese from electric furnaces. *Iron Age* **104**, 438-440 (Aug. 14, 1919).
- Knesche, F. A. Electric smelting of ores in the United States. *Iron Trade Rev.* **48**, 65 (1911).
- Kolowrat, L. Automatic regulation of electric furnaces. *Electrician* **64**, 474; *C. A.* **4**, 865.
- Korber, H. Resistance materials with variable temperature coefficients. *Z. angew. Chem.* **24**, 1402-1405; *C. A.* **5**, 3654.
- Kowalke, O. L. Electric furnace conversion of iron pyrites into a magnetic form. *Trans. Am. Electrochem. Soc.* **13**, 133 (1908).
- Kranz, W. G. Electric furnace in the foundry. *Bull. Am. Inst. Min. Eng.* **101**, 927-930 (1915); *Foundry* **43**, 164-165; *Iron Age* **95**, 780-781; *Met. Chem. Eng.* **13**, 565-566, 650 (1915); *C. A.* **9**, 2189.
- Kunze, W. Development of the modern electric furnace. *Stahl u. Eisen* **32**, 1089-1095, 1136-1141, 1181-1188; *C. A.* **6**, 2889.
- Kyle, W. J. Operating data on an important electric furnace installation. *Elec. Rev. West. Elec.* **68**, 374-376 (1916); *C. A.* **10**, 1007.
- Lagendonck, C. van. Helfenstein large electric furnace. *Iron Age* **94**, 478-480 (1914).
- Lane, H. M. Electric furnace and its use. *J. Cleveland Eng. Soc.*, Sept., 1910.
- Langmuir, I., Adams, E. Q., and Meikle, G. S. Flow of heat through furnace walls. *Trans. Am. Electrochem. Soc.* **24**, 53-84 (1914); *C. A.* **7**, 3713.
- Latest type of Rennerfelt furnace. *Elec. Rev., London*, **75**, 112-114 (July 17, 1914).
- Leeds, T. H. Use of electricity for crucible fusion. *Electrician* **38**, 407-8 (Jan. 22, 1897).
- Lindstrom, A. Leads for electric furnaces. *Met. Chem. Eng.* **16**, 683-687 (1917); *C. A.* **11**, 2753.



- Liston, J. Developments in the electrical industry during 1917. *Gen. Elec. Rev.* **21**, 4-52 (1918).
- Lombardi, L. Uniform distribution of current in high power electric furnaces. *Atti incoraggiamento Napoli* **67**, 45-63 (1917); *C. A.* **11**, 1363.
- Lorenz, A. W. Making electric furnace bottoms. *Foundry* **46**, 403 (1918); *C. A.* **13**, 399.
- Louvrier, F. Electric heat vs. heat from fuel. *Electrochem. Met. Ind.* **5**, 298 (1907).
- Electric and fuel furnaces compared. *Electrochem. Met. Ind.* **7**, 159 (1905); *C. A.* **3**, 1367.
- Electrometallurgy and electric furnaces. *Mining J.* **84**, 236-237 (Aug. 22, 1908).
- New type of electric furnace for the reduction of ores. *Met. Chem. Eng.* **11**, 710-713 (1913); *Eng. Mag.* **46**, 804-807 (1914); *C. A.* **8**, 868.
- Luzzati, S. The Stassano electric furnace. *L'Elettricità*, Oct. 5, 1902.
- Lyman, J. Power requirements of electric furnace. *Iron Age* **87**, 322-323 (Feb. 2, 1911).
- Lyon, Dorsey A. and Cullen, Joseph F. Design, construction and operation of electric furnaces. *Bureau Mines Tech. Paper* 77, Part 1; *C. A.* **9**, 754.
- and Keeney, R. M. Electrometallurgical industries as power consumers of electric power. *Bull. Am. Inst. Min. Eng.* 1915, 1707-30; *C. A.* **9**, 2736.
- and Keeney, R. M. Feasibility of western electrometallurgy. *J. Elec. Power Gas* **36**, 237-240, 262-263, 282-284, 296-298, 316, 318; *C. A.* **10**, 1730.
- and Keeney, R. M. Possible applications of the electric furnace to western metallurgy. *Trans. Am. Electrochem. Soc.* **24**, 119-166 (1913); *Met. Chem. Ind.* **11**, 577 (1913); *C. A.* **7**, 3572.
- and Keeney, R. M. Smelting of metals in the electric furnace. *Bureau Mines Tech. Paper* 77, Part 2; *C. A.* **9**, 754.
- McKnight, W. M. Details of the Stassano furnace at Warman Steel Casting Co., Redondo, Cal. *Elec. Rev. West. Elec.* **67**, 13 (1915); *C. A.* **10**, 16.

- McLain, R. H. Industrial control in the foundry. (Electrical regulators for electric furnaces.) *Proc. Am. Inst. E. E.* **34**, 587 (1915); *C. A.* **9**, 1272.
- Mailloux, C. O. Hydroelectric power and electrochemistry and electrometallurgy in France. *Met. Chem. Eng.* **16**, 265-273, 324-335 (1917); *C. A.* **11**, 1598.
- Malm, Walter R. High temperature experimental furnace. *Met. Chem. Eng.* **13**, 70 (1915); *C. A.* **9**, 754.
- Mann, F. P. Electrical progress on the continent in 1913. *Elec. Rev. West. Elec.* **64**, 16.
- Marchand, H. The electric blast furnace. *Rev. chim. ind.* **21**, 118; *C. A.* **5**, 247.
- Experiments on a tall electric furnace in Sweden. *Rev. gén. sci.* **20**, 799 (1909); *C. A.* **4**, 993.
- Mathieu, J. C. Operating characteristics of a small electric furnace. *Elec. W.* **67**, 262 (1916); *C. A.* **10**, 1302.
- Matignon, M. Recent progress in electrometallurgy. *Bull. soc. intern. elec.* **8**, 237-269 (1908); *C. A.* **2**, 2507.
- Melting metals in the induction furnace. *Iron Trade Rev.* **44**, 577-580 (Mar. 25, 1909); *C. A.* **4**, 716.
- Melting silver, nickel and bronze alloys by electricity. *Eng. Min. J.* **107**, 323-324 (1919).
- Mercer, R. G. Electric furnaces in the United Kingdom, 1918. *Foundry Trade J.* **21**, 295-301 (1919); *Electrician* **82**, 694-5 (1919); *Engineer* **127**, 490 (1919); *Iron Age* **103**, 1497-8 (1919).
- Merrick, C. B. Saving the waste with an electric furnace. *J. Elec.* **42**, 30-31 (1919).
- Messinger, C. R. Electric and converter castings compared. *Iron Age* **101**, 446-7; *Foundry* **46**, 71 (1918); *C. A.* **12**, 1360.
- Meyer, A. A. Electrical characteristics of electric furnaces. *Trans. Am. Electrochem. Soc.* **31**, 97-130 (1917); *C. A.* **11**, 2069.
- Miller, D. D. Electric treatment of airplane forgings. *Iron Age* **102**, 381-385 (1918); *C. A.* **13**, 92.
- Industrial applications of electricity. *Elec. W.* **72**, 693-5 (1918); *C. A.* **12**, 2282.

Minet, A. Electric furnace, its origin, transformation and application. *Trans. Faraday Soc.* **1**, 77 (1905); **2**, 1 (1906).

The origin, development and applications of the electric furnace. *Elektrochem. Z.*, June, 1903.

Miscellaneous installations of Girod electric furnaces. *Elec. Rev.* **58**, 300; *C. A.* **5**, 1367.

Moldenke, R. Electric furnace in the foundry. *Electrochem. Met. Ind.* **5**, 207 (1907); *C. A.* **1**, 2463.

Montgomery, R. L. Possibilities of the electric steel furnace. *Elec. Rev.* **71**, 182-84 (1917); *Elec. Rev. West. Elec.*, Aug. 4, 1917.

Moore, W. E. The electric furnace, its introduction into foundry practice. *Trans. Am. Electrochem. Soc.* **35**, 161-174 (1919); *C. A.* **13**, 91, 1186.

Electric furnaces. *J. Eng. Club, St. Louis* **4**, 166-183 (Mar., 1919).

Electric furnaces commercially classified. *Elec. J.* **14**, 144-146 (1917); *C. A.* **11**, 1362.

Modern electric furnace practice in foundries. *Mech. Eng.* **41**, 874-876 (1919).

Morrison, W. L. The electric furnace in the foundry. *Am. Found. Assn.*, Sept., 1914; *Iron Age* **94**, 777-778 (1914); Discussion, F. T. Snyder, *Ibid*, 779; *Iron Trade Rev.* **57**, 177-179 (1915); *C. A.* **9**, 176.

Mottelay, P. F. Bibliography of electrochemistry. *Trans. Am. Electrochem. Soc.* **13**, 453-481 (1908); *C. A.* **2**, 3030.

Myers, C. Electric furnaces. *Electrician* **68**, 828-829; *C. A.* **6**, 1256.

Naylor, J. W. Electric furnaces from a steelmaker's point of view. *Electrician* **83**, 363-367 (1919); *C. A.* **14**, 151.

Nesbit, C. T. Crucible vs. electric furnace. *Chem. World* **3**, 131-132; *C. A.* **8**, 2846.

Neumann, B. Blast furnace and electric furnaces. *Stahl u. Eisen* **29**, 276-280 (Feb. 24, 1909).

Present condition of electrosiderurgie. *Rev. métal.* **7**, 1048-1053 (1910).

Silicon as a reducing agent for the oxides of high melting metals. *Z. Elektrochem.* **14**, 169-172; *C. A.* **2**, 1661.

- New data on electric smelting in Sweden. *Iron Age* **93**, 1268-1270 (May 21, 1914).
- New electric annealing furnace (Niagara Falls). *Metal Ind.* **12**, 279-280; *Met. Chem. Eng.* **12**, 483-485 (1914); *C. A.* **8**, 3269.
- New installations of Heroult furnaces. *Iron Age* **96**, 937 (1915); *C. A.* **10**, 16.
- New Rennerfelt electric furnaces. *Iron Age* **98**, 737 (1916); *C. A.* **10**, 2667.
- Nicou, Paul. Electric blast furnace. *Tech. mod.*, Aug. 15, 1913.
- Hans Bie Lorentzen electric blast furnace. *Ann. mines; Lumière elec.* **23**, 305-306; *C. A.* **7**, 3921.
- Northrup, E. F. Cascade attachment for graphite furnace. *Met. Chem. Eng.* **12**, 305-306 (1914); *C. A.* **8**, 2650.
- Electric conduction at high temperatures and how to measure it. *Trans. Am. Electrochem. Soc.* **25**, 373-392 (1914); *Met. Chem. Eng.* **12**, 340 (1914); *C. A.* **8**, 2651.
- High frequency induction heating today. *Chem. Eng.* **27**, 167-168 (1919); *C. A.* **13**, 1046, 2311.
- New high frequency induction furnace. *Met. Chem. Eng.* **17**, 501 (1917); *C. A.* **11**, 3177.
- New high temperature furnace. *Met. Chem. Eng.* **12**, 31-33 (1914); *C. A.* **8**, 1542.
- Principles of inductive heating with high frequency currents. *Trans. Am. Electrochem. Soc.* **35**, 69-159; *C. A.* **13**, 1046.
- Northrup-Ajax high frequency induction furnace. *Chem. Met. Eng.* **19**, 155-156 (1918); *Mach.* **24**, 1157; *Am. Mach.* **49**, 364 (1918); *C. A.* **12**, 2068.
- Northrup-Ajax induction furnace. *Iron Age* **103**, 1294-5 (1919).
- Oesterheld, G. An electric vacuum furnace of universal applicability. *Z. Elektrochem.* **21**, 54-60 (1915); *C. A.* **9**, 3028.
- Oesterreich, M. Helfenstein large electric furnace. *Stahl u. Eisen* **33**, 305-311 (Feb. 20, 1913).
- Orndt, K. Electrically heated laboratory furnace for high temperatures. *Elektrotechn. Z.* **37**, 119 (1916); *C. A.* **12**, 2554.



- Parsons, C. A. Notes on carbon at high temperatures and pressures. *Proc. Roy. Soc. London (A)* **79**, 532-535; *C. A.* **2**, 1527.
- Patten, H. A. Energy changes accompanying absorption. *Trans. Am. Electrochem. Soc.* **11**, 387-407 (1907); *C. A.* **2**, 3.
- Perkins, F. C. German crucible electric furnace of the transformer type. *Chem. Eng.* **18**, 97-99; *C. A.* **7**, 3921.
- Peters, F. Electrometallurgy in the year 1904. *Glückauf.* **41**, 717-727 (June 10, 1905).
- Electrometallurgy in 1905 and the first half of 1906. *Glückauf.* **42**, 1384-1391, 1443-1452, 1469-1476, 1519-1524, 1552-1559, 1582-1589, 1619-1625, 1644-53 (1906).
- Peterson, O. Materials adapted for lining electric furnaces. *Mining Eng. World* **43**, 695 (1915); *C. A.* **10**, 1134.
- Pinot, E. Present state of the electrochemical and the electrometallurgical industries. *Rev. électrochim.* **7**, 175-184, 212-227.
- Podkepaer, N. I. Alloys of platinum and tin. *J. Russ. Chem. Soc.* **40**, 249-60; *C. A.* **2**, 2367.
- Poisson, H. Metallurgical application of electric heating. *Sci. Am. S.*, Mar. 20, 1897, 17690-17691.
- Present status of the induction furnace. *Met. Chem. Eng.* **11**, 99-102 (1913).
- Preval, N. Rennerfelt electric furnace. *Rev. industriel.* **45**, 41-43 (Jan. 24, 1914).
- Production and distribution of electric furnace products. *J. four elec.* **28**, 25 (1919); *C. A.* **13**, 1047.
- Production of metals, especially zinc, in the electric furnace. *J. four elec.* (1916), 109-112; *C. A.* **11**, 1363.
- Progress of electric metal melting furnaces. *Metal Ind.* **16**, 66; *C. A.* **12**, 1267.
- Randall, K. C. Study in furnace conductors for heavy alternating currents. *Trans. Am. Electrochem. Soc.* **17**, 139-147 (1910); *C. A.* **4**, 2769.
- Raydt, U. Modification of the Tamann furnace. *Z. Elektrochem.* **20**, 185-186; *C. A.* **8**, 2112.
- Recent improvements in the use of the electric furnace. *Sci. Am.* **109**, 84-85 (1913).

- Refractory materials for furnace linings. *Electrochem. Met. Ind.* **3**, 140-141 (1905).
- Reid electric smelting process. *Eng. Min. J.* **91**, 564; *C. A.* **5**, 1872.
- Rennerfelt electric furnace. *Engineering* **98**, 638-641 (1914); *Eng. Min. J.* **99**, 400-402 (1915); *Iron Age* **92**, 190; *J. Ind. Eng. Chem.* **7**, 159 (1915); *Met. Chem. Eng.* **13**, 702-3 (1915); *C. A.* **7**, 3079; **9**, 556.
- Revessi, G. Electric furnaces. *Rivista l'elettrotecnica*, Nov. 15, 1918, p. 454; *Met. italiana* **10**, 565-572; *C. A.* **13**, 1672.
- Review of the electrochemical and electrometallurgical industries of Switzerland. *J. four elec.* **28**, 33-34 (1919).
- Reyval, J. The Vigeland aluminum factories near Vennesla, Norway. *Lumière élec.* **30**, 298-303, **31**, 8-14 (1915); *C. A.* **10**, 561.
- Rice, E. W., Jr. Review and forecast of the electrical industry. *Gen. Elec. Rev.* **21**, 528-534 (1918); *C. A.* **12**, 1855.
- Richards, J. W. Conditions of progress in electrochemistry. *Trans. Am. Electrochem. Soc.* **3**, 59 (1903).
- Efficiency of electric furnaces. *Electrochem. Ind.* **1**, 46 (1902); *Trans. Am. Electrochem. Soc.* **2**, 51 (1902).
- Electric power required to melt metals. *Metal Ind.* **8**, 456-458; *C. A.* **5**, 831.
- Electrochemical industries of Norway. *Trans. Am. Electrochem. Soc.* **20**, 403 (1911).
- Electrochemistry at Sault Ste. Marie. *Electrochem. Ind.* **1**, 85 (1902).
- Gas circulation in electrical reduction furnaces. *Trans. Am. Electrochem. Soc.* **21**, 403-418 (1912); *C. A.* **6**, 1879.
- Metallurgical calculations VI. Efficiency of furnaces. *Electrochem. Met. Ind.* **3**, 299 (1905).
- Metallurgical calculations. *Electrochem. Met. Ind.* **5**, 165-71 (1907); *C. A.* **1**, 1964; *Electrochem. Met. Ind.* **5**, 496-7 (1907); *C. A.* **2**, 984; *Electrochem. Met. Ind.* **6**, 194-8 (1908); *C. A.* **2**, 1813.
- Vaporization of metals. *Met. Chem. Eng.* **10**, 754 (1912); *C. A.* **7**, 730.
- Rodenhauser, W. Electric furnace. *Elek. Kraft. u. Bahnen* **10**, 281-286 (May 24, 1912).

- Roeber, E. F. Electrode losses in electric furnaces. *Trans. Am. Electrochem. Soc.* **16**, 363 (1909); *C. A.* **4**, 1269.  
Electrometallurgy. *Trans. Inter. Eng. Congress*, 1915, 457-478; *C. A.* **10**, 2841.
- Rosenhain, W and Coad-Pryor, E. A. High temperature electric resistance furnace. *Trans. Faraday Soc.* Adv. proof, 7 pp.; *C. A.* **13**, 3083.
- Rossi, A. J. Electric smelting and blast furnace gases. *Electrochem. Met. Ind.* **3**, 150-151, 190-193 (1905).
- Rowlands, T. Electric furnaces of the induction type. *Iron Age* **85**, 1136-1141 (May 12, 1910).
- Rowlinson, F. Electric furnaces. *Sci. Am. S.* **88**, 132-133, 180-181 (Aug. 30, Sept. 20, 1919).
- Ruder, W. E. High temperature resistance furnaces with ductile molybdenum or tungsten resistors. *Bull. Am. Inst. Min. Eng.* **134**, 136, 585-91, 716-717; *C. A.* **12**, 789.
- Ruff, O. Electric vacuum furnace for high temperatures. *Z. Elektrochem.* **20**, 177-9 (1914); *C. A.* **8**, 1916.
- Rutgers, F. Industrial application of electric heating. *Génie Civil* **75**, 189-194 (Aug. 30, 1919).
- Ruthenberg, M. Electric smelting furnaces and their application. *Trans. Am. Electrochem. Soc.* **18**, 185 (1910); *C. A.* **5**, 1710.
- Ryan, F. J., McKee, E. E. and Walker, W. D. Ideal electric furnace for foundry. *Iron Age* **98**, 616-617 (1916); *C. A.* **10**, 2841.
- Sabersky, E. and Adler, E. New electrical hardening furnace. *Elec.* **63**, 22-24; *C. A.* **3**, 1493.
- Sahlin, Axel. New type of electric furnace. *Elec. News* **28**, 32-34 (June 1, 1919); *Elec. Rev.* **84**, 591-593 (May 23, 1919); *Elec. W.* **74**, 139 (1919); *Elec.* **83**, 164-167 (1919); *Engineering* **107**, 655 (1919); *Iron Coal Trades Rev.* **98**, 618 (May 9, 1919); *C. A.* **13**, 2485; *Foundry Trade J.* **21**, 302-304 (1919).
- Rennerfelt electric furnace. *Iron Coal Trades Rev.*, Dec. 19, 1913.
- Rennerfelt electric furnace with crucible works and smelter. *Eng. Mag.* **47**, 104-106 (1914).

St. Johns, H. M. Commercial testing of metallurgical electric furnaces. *Chem. Met. Eng.* **21**, 377-392 (1919); *C. A.* **13**, 3088.

Rocking electric arc furnace. *Chem. Met. Eng.* **21**, 13-15 (1919); *Metal Ind.* **17**, 320-322 (1919); *C. A.* **14**, 18.

Saturated core reactors for electric furnace loads. *Elec. Rev.* **74**, 1046 (1919); *C. A.* **13**, 1974.

Scarpa, O. Power factor of the electric arc furnace. *Rivista tecnica d'elettricità*, No. 1891, 105-106 (Oct. 25, 1918).

Schmelz, E. M. Keeping an electric furnace hot during periods of idleness. *Met. Chem. Eng.* **12**, 216 (1914); *C. A.* **8**, 2112.

Scott, A. L. Energy consumption and operating schedule for a one ton furnace connected to central station lines. *Elec. W.* **67**, 943 (1916); *C. A.* **10**, 1730.

Scott, E. K. Greaves-Etchells electric furnace. *Met. Chem. Eng.* **17**, 243-5 (1917).

The Hering pinch effect furnace. *Trans. Faraday Soc.* **7**, 202; *Chem. Ztg.* **35**, 1133-1134; *C. A.* **6**, 2889, 3360.

Seede, J. A. Electric furnace control. *Gen. Elec. Rev.* **19**, 501-5 (1916); *C. A.* **10**; 1813.

Siebert, N.<sup>1</sup> An electric resistance furnace with a resistor of base metals. *Chem. Ztg.* **35**, 443; *C. A.* **5**, 2278.

Siemens manufacturing concerns in Greater Berlin. *Electrician* **69**, 352; *C. A.* **6**, 2033.

Single and three-phase electric furnaces. *Elec. World* **70**, 840 (1917); *C. A.* **12**, 22.

Single electrode electric furnaces for making and refining steel. *Elec. World* **67**, 670 (1916); *C. A.* **10**, 1134.

Single phase transformers for electric furnace service. *Elec. Rev.* **74**, 765 (1919); *C. A.* **12**, 1282.

Slade, R. E. Electric furnace for experiments in vacuo at temperatures up to 1500°. *Electrician* **71**, 479; *C. A.* **7**, 3080.

Small-size electric arc furnace for melting and refining. *Met. Chem. Eng.* **12**, 275-7; *C. A.* **8**, 2112.

Snowdon, R. C. Electric crucible furnace. *Cornell Chemist* **4**, 13-14; *C. A.* **8**, 2846.

Snyder, F. T. Commercial electric furnaces and their uses. *Automotive Eng.* **4**, 29-32 (1919); *C. A.* **13**, 1045.



- Electric furnace power loads. *Elec. World* **65**, 1527 (1915); *C. A.* **10**, 15.
- Flow of heat through furnace walls. *Trans. Am. Electrochem. Soc.* **18**, 235 (1910); *C. A.* **5**, 1873.
- Reliability of electric furnace for chemical work. *Chem. Eng.* **13**, 153; *C. A.* **5**, 2467; *Iron Age*, Jan. 26, 1911.
- Single phase and three phase operations of electric furnace. *W. Engineering* **6**, 10-13 (July, 1915).
- Study of electric furnace operation. *Elec. Rev. West. Elec.* **71**, 171-5 (1917); *C. A.* **11**, 2752.
- Somerville, Albert A. Small tubular resistance furnace. *Elec. World* **56**, 1476; *C. A.* **5**, 831.
- Some recent improvements in the use of the electric furnace. *Sci. Am.*, Aug. 2, 1913.
- Special type of electric furnace. *Chem. Eng.* **16**, 151-153.
- Standardizing electrodes for electric furnaces. *Iron Age* **98**, 1369 (1916); *C. A.* **11**, 234.
- Stange. The electrochemical industry. *Elektrochem. Z.* **15**, 1-5, 36-39, 60-63 (1918).
- Stansfield, A. The electric furnace—its evolution, theory and practice. *Can. Eng.* **13**, 170-173 (May, 1906).
- Stassano, E. The Stassano thermo electric furnace. *Eng. Min. J.* **83**, 1135-7 (June 15, 1907).
- Static transformers for use with electric furnaces. *Electrician* **83**, 69-70 (1919); *C. A.* **13**, 2159.
- Stephan. Production of metals in the electric furnace. *Chem. Ztg.* **36**, 1194; *C. A.* **8**, 2846.
- Stievenart, A. Electrosiderurgy. *Bull. sci., Liège*, **14**, 93-107; *C. A.* **6**, 3361.
- Sutherland, W. F. Types of electric furnaces. The Rennerfelt. *Can. Machy.* **21**, 328-330 (Apr. 3, 1919).
- Swan, J. W. Electrochemical industry. *J. Soc. Chem. Ind.* **20**, 663-675 (1902).
- Taussig, Rudolf. Helfenstein furnaces. Recent developments in large electric furnaces. *Orig. Com. 8th Inter. Cong. Appl. Chem.* **21**, 105.
- Large electric furnaces. *Z. Elektrochem.* **15**, 542; *Trans. Faraday Soc.* **5**, 524; *C. A.* **3**, 2906; **4**, 1427.

- Taylor, E. R. Closed electrolytic furnace for reducing and distilling metals from their ores. *Trans. Am. Electrochem. Soc.* **11**, 295-301 (1907); *C. A.* **2**, 22.
- Thallner, O. Influence of heating and metallurgical operations on crystallization in electric furnaces both acid and basic. *Rev. métal.* **7**, 1060-1063; *C. A.* **5**, 2219.
- Thomas, F. Electric resistance furnace with adjustable length of bath. *Metallurgie* **9**, 158-160; *C. A.* **6**, 1570.
- Thompson, M. DeKay. Electrochemistry and electric furnaces. *Elec. Rev. West. Elec.* **70**, 9 (1917); *C. A.* **11**, 325.
- Thornton, Frank, Jr. Resistance furnace. *Trans. Am. Electrochem. Soc.* **32**, 141-154 (1917).
- Thovez, E. Development of the electric arc furnace. *Elettrotecnica* **5**, 447-481 (1918).
- Three-phase induction furnace. *Eng. News* **60**, 285; *C. A.* **2**, 3069; **3**, 1120.
- Threlfall. Electricity as applied to metallurgy. *Aust. Min. Stand.* (Aug. 12, 1897, Sept., 1896).
- Tone, F. J. Electric furnace products. *Met. Chem. Eng.* **14**, 509-511 (1916); *Iron Age* **97**, 1124-1125 (1916).
- Electrochemistry in its human relations. *Chem. Met. Eng.* **20**, 413-416 (1919); *Manuf. Record* **75**, 97-98; *Trans. Am. Electrochem. Soc.* **35**, 31-37 (1919); *C. A.* **13**, 1044.
- Niagara Falls power and American industry. II. Furnace products. *Met. Chem. Eng.* **14**, 509-511; *Mining Eng. World* **44**, 907-909; *Trans. Am. Electrochem. Soc.* **29**, 66-73 (1916); *C. A.* **10**, 1811.
- Production of silicon and alloys containing silicon. *Trans. Am. Electrochem. Soc.* **7**, 243-249 (1905).
- Silicized carbon-silfrax. *Trans. Am. Electrochem. Soc.* **26**, 181-198 (1914); *C. A.* **9**, 266.
- Trasenter, E. Electrometallurgy of steel. *Rev. Univ. Mines Metals* **21**, 252-293; *C. A.* **3**, 1367.
- Tucker, S. A. Electrochemistry as applied to industrial chemistry. *J. Soc. Chem. Ind.* **27**, 267-268 (1908); *C. A.* **2**, 1779.
- Granular carbon electric furnace. *Met. Chem. Eng.* **17**, 10 (1917); *C. A.* **11**, 2431.
- A granular carbon resistance furnace. *Trans. Am. Electrochem. Soc.* **11**, 307-315 (1907); *C. A.* **2**, 23.

- Platinum resistance furnace. J. Am. Chem. Soc. **29**, 1442-1444 (1910); C. A. **2**, 373.
- Vertical arc furnaces for the laboratory. Electrochem. Met. Ind. **4**, 263 (1906).
- Ubbelohde, L. Electric laboratory furnaces with wire resistors of a base metal. Z. Elektrochem. **17**, 1002; C. A. **6**, 573.
- Unger, Magnus. Action of electromechanical forces on the bath of induction furnaces. Met. Chem. Eng. **10**, 263-265; C. A. **6**, 2578.
- Electric hardening furnaces. Gen. Elec. Rev. **16**, 158; C. A. **7**, 1443.
- Van Brussel, J. B. Trollhattan electric smelter. Eng. Min. J. **92**, 650-652 (Sept. 30, 1911); C. A. **5**, 3654.
- Van Langendonck, C. The Helfenstein large electric furnace. Iron Age **94**, 478-480 (Aug. 27, 1914).
- Vom Baur, C. H. Crafts electric furnace of the induction type. Iron Age **92**, 612-613 (1913).
- Electric furnaces. Chem. Met. Eng. **20**, 488-489 (1919); C. A. **13**, 2808; Elec. World **72**, 21 (1918); Iron Trade Rev. **62**, 540-541.
- Rennerfelt electric furnace. Iron Age **97**, 1052-1053 (1916); Chem. Eng. **23**, 1912 (1916); Trans. Am. Electrochem. Soc. **29**, 497-514 (1916); Trans. Am. Electrochem. Soc. **31**, 87-96 (1917); C. A. **10**, 1812.
- Walsh, Geo. E. The commercial development of electro-metallurgy. Min. Sci. Press **91**, 9 (July 1, 1905).
- Watts, Oliver P. An electric furnace for heating crucibles. Electrochem. Met. Ind. **4**, 273-275 (1906).
- Electric arc furnace for laboratory use. Met. Chem. Eng. **14**, 681-683 (1916); C. A. **10**, 2666.
- and Breckenridge, J. M. Calcium alloys for aluminothermic work. Electrochem. Met. Ind. **6**, 237-238; C. A. **2**, 2366.
- Weckbecker, Julius. Process for the production of silicon free or low silicon metals or alloys and of metallic silicides successively from an ore. Metallurgie **4**, 317-319 (1907); C. A. **1**, 1965.

- Weidenthal, H. G. Square deal for the electric furnace. *Chem. Met. Eng.* **21**, 779-780 (Dec. 24, 1919); *Trans. Am. Electrochem. Soc.* **36** (1919); *C. A.* **13**, 1808.
- Weiss, Ludwig. Helberger fusion furnace. *Elektrochem. Z.* **16**, 65-67; *C. A.* **13**, 1618, 2080.
- Weitlaner, R. J. Comparative furnace efficiency. *Met. Chem. Eng.* **13**, 357-361 (1915).
- Wellman, S. F. Discussion of the electric furnace. *Iron Trade Rev.* **50**, 1224 (1912).
- White, G. R. Laboratory resistance furnace. *Trans. Am. Electrochem. Soc.* **9**, 143-144 (1906); *C. A.* **1**, 12.
- Wilcox, E. A. Electric furnaces. *J. Elec. Power Gas* **38**, 48 (1917); *C. A.* **11**, 917.
- Economic industrial application of electricity. *W. Soc. Eng. J.* **22**, 569-572 (1917); *Sci. Am. S.* **85**, 146-147 (1918).
- Wilda, H. Electric smelting furnaces. *Elektrotech. u. Polytech. Rundschau.* **24**, 347-347 (Aug. 7, 1907).
- Wiley, B. Regulation of the electric furnace. *Elec. J.* **14**, 138-140 (1917); *C. A.* **11**, 1599.
- Williams, R. G. The grinding wheel. A connecting link between the electric furnace and the automobile. *Met. Chem. Eng.* **16**, 599-603 (1917); *Trans. Am. Electrochem. Soc.* **31**, 181-195 (1917); *C. A.* **11**, 1792.
- Williamson, M. A. Alundum manufacture and use. *Metal Ind.* **16**, 128-129 (1918); *C. A.* **12**, 881.
- Wills, W. H. and Schuyler, A. H. Heat losses from an electric furnace. *Trans. Am. Electrochem. Soc.* **28**, 207-220 (1916); *Iron Age* **96**, 1052-1053 (1915).
- Wiring and control for large electric furnace. *Elec. World* **74**, 304-305 (1919); *C. A.* **13**, 2159.
- Wolf, J. and Müller, E. An electric vacuum furnace for high temperatures. *Z. Elektrochem.* **20**, 1-4; *C. A.* **8**, 1915.
- Work of the electric furnace. *Elec. Eng.* **52**, 12-13 (Nov., 1918).
- Wright, J. The electric furnace. *Cassier's Mag.*, June, 1903. Electric furnaces and their industrial application. 1905. Some electric furnace processes. *Cassier's Mag.* **26**, 24-39 (May, 1904).



Yardley, J. L. McK. Notes on electric furnace problems. Bull. Am. Inst. Min. Eng. **142**, 1593-1898 (1918); **148**, 690-691 (1919); C. A. **13**, 283.

Yngstrom, L. Electric shaft furnace at Domnarfvet, Sweden. Met. Chem. Eng. **8**, 11 (1913); C. A. **4**, 863.

## ELECTRODES.

Barhan, G. B. Electrodes for electric furnaces. Elec. Rev. (London), Apr. 18, 1913.

Barnett, C. A. Electric furnace electrodes, their manufacture and uses. Sibley J. Eng. **30**, 27-32 (1915); C. A. **11**, 314.

Bay, I. Evolution of the electrode. L'Electricien **37**, 358-60, 379-82, 396-398, 404-405 (1909); C. A. **3**, 2086.

Clocher, Wm. Manufacture of carbons. Elec. Rev., Jan. 20, 1911; Met. Chem. Eng. **9**, 137-141 (1911).

Collins, C. L. Graphite electrodes in electrometallurgical processes. Trans. Am. Electrochem. Soc. **1**, 53 (1902).

Design of electric furnace electrodes. Electrochem. Met. Eng. **7**, 502 (1909); C. A. **4**, 1844.

Effect of heat leakage on the electrode loss. Met. Chem. Eng. **8**, 59-60 (1910); C. A. **4**, 1845.

Electrode holders construction for electric furnaces. Stahl u. Eisen **33**, 472-478, 555-561 (1913); Met. Chem. Ind. **11**, 321-326 (1913); C. A. **7**, 2354.

Electrode manufacture. Elec. Times **55**, 1311 (1919); C. A. **13**, 1424.

Electrode situation (in France). J. four elec. 1917, 17-18; C. A. **11**, 1363.

Escard, J. Electrodes for electric furnaces. Their manufacture, properties and utilization. Gén. Civil, Aug. 4, 1917; Elec. Rev., Sept. 14, 1917; Gen. Elec. Rev. **21**, 664-671, 781-792 (1918).

Favorney, O. Electrodes of pure graphite and their use in electric metallurgy. Rev. Industriel. **43**, 464-7 (Aug. 24, 1912).

FitzGerald, F. A. J. On carbons for electric metallurgy. Trans. Am. Electrochem. Soc. **11**, 317-327 (1907); C. A. **2**, 23.

- On testing carbon electrodes. *Trans. Am. Electrochem. Soc.* **2**, 43 (1902).
- and Hinckley, A. I. Experiments with furnace electrodes. *Trans. Am. Electrochem. Soc.* **23**, 333-350 (1913).
- Electrode suspension in electric furnaces. *Stahl. u. Eisen* **33**, 472-478 (Mar. 20, 1913).
- Forrsell, J. Current densities and energy losses in electrodes. *Met. Chem. Eng.* **8**, 26-32 (1910); *C. A.* **4**, 1844.
- Hansen, C. A. Furnace electrode losses. *Electrochem. Met. Ind.* **7**, 358-359 (1909); *C. A.* **4**, 149; *Trans. Am. Electrochem. Soc.* **15**, 279-294 (1909); *Ibid.* **16**, 329-352 (1909); *C. A.* **3**, 2652; **4**, 1845.
- Hering, C. Design of furnace electrodes. *Elec. World* **55**, 1508 (1910); *C. A.* **4**, 1845, 2069.
- Chilling or heating action of furnace electrodes versus least electrode loss. *Met. Chem. Eng.* **8**, 188-190 (1910); *C. A.* **4**, 1939.
- Determination of the constants of materials for furnace electrodes. *Trans. Am. Electrochem. Soc.* **17**, 151-170 (1910); *C. A.* **4**, 2769.
- Electrode construction for furnaces. *Met. Chem. Eng.* **9**, 67-78 (1911); *C. A.* **5**, 1711.
- Electrode efficiency of furnaces. *Electrochem. Met. Ind.* **7**, 473-474 (1909); *C. A.* **4**, 148.
- Empirical laws of furnace electrodes. *Trans. Am. Electrochem. Soc.* **17**, 171-198 (1910); *C. A.* **4**, 2769.
- Furnace electrodes. *Met. Chem. Eng.* **8**, 391-392 (1910); *C. A.* **4**, 2412.
- Furnace electrode losses. *Electrochem. Met. Ind.* **7**, 400-403 (1909); *C. A.* **3**, 2907.
- Laws of electrode losses in electric furnaces. *Trans. Am. Electrochem. Soc.* **16**, 265-297 (1909); *Electrochem. Met. Ind.* **7**, 442-448 (1909); *C. A.* **4**, 1845.
- New method of measuring thermal and electrical conductivities of furnace electrodes. *Trans. Am. Electrochem. Soc.* **16**, 317-324 (1909); *C. A.* **4**, 1845.
- Properties and behavior of furnace electrodes. *Met. Chem. Eng.* **8**, 128-130 (1910); *C. A.* **4**, 1845; See also *Met. Chem. Eng.* **9**, 42, 67, 665 (1911); **10**, 128, 154, 206 (1912).

- Proportioning of electrodes for furnaces. *Proc. Am. Inst. Elec. Eng.* **29**, 285 (1910); *C. A.* **4**, 1845.
- Kennelly, A. E. Modification in Hering's law of furnace electrodes. *Proc. Am. Inst. Elec. Eng.* **29**, 267 (1910); *C. A.* **4**, 1845.
- Kunze, W. Automatic electrode regulation for arc furnaces. *Stahl u. Eisen* **38**, 125-130, 152-159, 184-194, 212-217 (1918); *C. A.* **13**, 3085.
- Mahlke, A. New form of electrode. *Met. Chem. Eng.* **9**, 42-43 (1911); *C. A.* **5**, 1020.
- Manufacture of electric furnace electrodes. *L'Elec.* **38**, 339-342 (Nov. 27, 1909).
- Perkins, F. C. Refining steel from Bessemer converter by a composite electric arc process. *Chem. Eng.* **14**, 406; *C. A.* **6**, 29.
- Production of carbon electrodes for metallurgical purposes. *Stahl u. Eisen* **32**, 1857-1865 (Nov. 7, 1912); *C. A.* **7**, 731.  
This article contains a complete bibliography.
- Properties and uses of furnace electrodes. *Elec. World* **70**, 963-964 (1917); *C. A.* **12**, 252.
- Roeber, E. F. Electrode losses in electric furnaces. *Trans. Am. Electrochem. Soc.* **16**, 363-391 (1909); *C. A.* **4**, 1269.
- Roush, G. A. Manufacture of carbons for steel furnaces. *J. Ind. Eng. Chem.* **1**, 286-295 (1909).
- Standard electrodes for electric furnaces. *Iron Age* **98**, 1369 (1916); *C. A.* **11**, 234.
- Styri, H. Electrode cooling. *Met. Chem. Eng.* **17**, 233 (1917); *C. A.* **11**, 2753.
- Turnbull, R. T. Furnace electrodes practically considered. *Trans. Am. Electrochem. Soc.* **21**, 397-402 (1912); *Chem. Eng.* **15**, 68-70 (1912); *C. A.* **6**, 1256.

## IRON.

- Allen, H. Electric furnace in the iron and steel industries. *Cassiers' Mag.*, **27**, 358-362 (1905).
- Application of electricity to the smelting of iron ores. *Mech. Eng.* **19**, 39-41 (1907).

- Application of the electric furnace to the metallurgy of iron and steel. *Electrochem. Ind.* **2**, 307-310 (1904).
- Armstrong, D. E. Electric low phosphorus pig iron. *Can. Chem. J.* **2**, 190 (1918); *C. A.* **12**, 1614.
- Arnou, G. Direct reduction of iron ores in the electric furnace. *Rev. métal.* **7**, 1054-1058 (1910).
- Present state of the electrometallurgy of iron. *Lumière élec.* **12**, 4-7; *C. A.* **5**, 29.
- Progress realized in the reduction of iron ores in the electric furnace. *Lumière élec.* **16**, 269; *C. A.* **6**, 456.
- Aston, J. Progress in the electrometallurgy of iron and steel. *Wis. Engr.*, Nov., 1910.
- Baily, T. Data on the operation of the electric furnace. *Elec. World* **71**, 780-781 (1918); *C. A.* **12**, 1149.
- Beilstein, A. Electric pig iron production in Scandinavia. *Stahl u. Eisen* **33**, 1270-1278.
- Bell, F. H. Electric furnace in the gray iron foundry. *Can. Machy.* **21**, 7-8 (1919); *C. A.* **13**, 1422.
- Bennie, P. McN. Application of the electric furnace to the metallurgy of iron and steel. *Electrochem. Ind.* **2**, 307 (1904).
- The electric furnace. *Iron Age* **85**, 216-218; *C. A.* **5**, 629.
- The electric furnace for iron and steel. *Iron Trade Rev.* 1904, **27**, 63, 66.
- Electric furnace in the iron and steel industry. *Electrochem. Met. Ind.* **7**, 322; *C. A.* **3**, 2086.
- Electric furnace pig iron in California. *Trans. Am. Electrochem. Soc.* **15**, 35-38; *Electrochem. Met. Ind.* **7**, 251 (1909); *C. A.* **3**, 2534.
- Electric furnace. Its place in siderology. *Proc. Eng. Soc. W. Penn.* **26**, 487 (1911).
- Position of the electric furnace. *Eng. Min. J.* **88**, 80; *C. A.* **3**, 2777.
- Bibby, J. Development in electric iron and steel furnaces. *Iron Coal Trades Rev.* **98**, 611-617; *Engineer* **127**, 513-515; *Elec. World* **74**, 84, 712-713 (1919); *Foundry Trade J.* **21**, 311-323 (1919); *Electrician* **83**, 214-216; *Elec. Rev. (London)* **84**, 136, 166, 176 (1919); *C. A.* **13**, 1423; **14**, 16.



- Borchers, W. Electro-metallurgy in the iron industry. *Stahl u. Eisen* **18**, 304-311 (April 1, 1898).
- The present status of electric smelting of iron and steel. *Z. Ver. Deutscher Ing.*, June 10, 1905; *Stahl u. Eisen* **25**, 631-637, 689, 693 (June, 1905).
- Reduction of oxide ores in the electric furnace. *Stahl u. Eisen* **31**, 706-707 (May 4, 1911).
- Bordewich, Henry. Iron and steel by electric processes. *Consular reports* **13**, 789; *C. A.* **5**, 629.
- Boving, J. O. Electric iron smelting. *Electrician* **79**, 613 (1917); *C. A.* **11**, 2561.
- New data on electric smelting in Sweden. *Iron Age* **93**, 1268-1270; *C. A.* **8**, 2651.
- Bridge. Electric furnaces. *L'Electricien* **38**, 187; *C. A.* **3**, 2907.
- Burger, Julius. Electrometallurgy of iron and steel. *Elek. Kraft. u. Bahnen*, Nov. 14, 1910; *C. A.* **5**, 1233.
- Cain, J. R., Schran, E., and Cleaver, H. E. Preparation of pure iron and iron carbon alloys. *J. Ind. Eng. Chem.* **8**, 217-220; *U. S. Bur. Standards, Bull.* **13**, 4-16 (1916).
- Campbell, D. F. Progress in the electrometallurgy of iron and steel. *Trans. Faraday Soc.* **7**, 198; *Elec. Rev. West. Elec.* **59**, 980; *Electrician* **68**, 149 (1912); *Chem. News* **104**, 192-194; *C. A.* **6**, 28, 964.
- Carcano, F. E. Electrometallurgical applications. *Elettrotecnica* **2**, 690-698 (1915); *C. A.* **10**, 2842.
- Production of pig iron in the electric furnace and the industrial utilization of pyrite residues. *Electrochem. Met. Ind.* **7**, 155-156; *C. A.* **3**, 1493; *Industria*, Dec. 19, 1909.
- Catani, Remo. Large electric furnace in the electrometallurgy of iron and steel. *Trans. Am. Electrochem. Soc.* **15**, 159-172 (1909); *Electrochem. Met. Ind.* **7**, 268; *C. A.* **3**, 2535.
- Production of pig iron in the electric furnace and in the blast furnace. *Industria*, Feb. 7, 1909.
- Reduction of iron ore in the electric furnace. *Electrochem. Met. Ind.* **2**, 153 (1909).

- Cirkel, F. Preparation of pig iron in electric furnace. *Stahl u. Eisen* **26**, 868-871, 1369-1373 (1906).
- Cone, E. F. High grade pig iron from scrap steel. *Iron Age* **100**, 485-489, 497, 629 (1917); *C. A.* **11**, 2753.
- Cost of electric pig iron production in North Sweden. *Engineering* **104**, 621-623 (1917); *C. A.* **12**, 564.
- Crawford, J. Electric smelting as conducted at Heroult. *Mine and Industries*, 1913; *Min. Sci. Press* **106**, 987-989.
- Progress of electric smelting at Heroult, California. *Met. Chem. Eng.* **11**, 383-388 (1913).
- Demenge, E. Application of the electric furnace in the iron industry. *Le Genie Civil* **33**, 205-207, 220-1 (July 30, Aug. 6, 1898).
- Doubs, F. Production of white cast iron in the electric furnace from cold and molten charge. *Stahl u. Eisen* **31**, 589-92 (Apr. 13, 1911).
- Dushman, S. Electrometallurgy of iron and steel. *Trans. Eng. Soc., W. Toronto*, No. 20 (1908).
- Eckmann, S. H. Electricity in iron and steel works and allied metal industries. *Electrician* **70**, 389; *C. A.* **7**, 572.
- Ehrenwert, Joseph V. Electric preparation of iron. *Oesterr. Z. Berg-Hüttenw* **56**, 1-4, 21-24; *C. A.* **2**, 1120.
- Eichhoff. The Heroult electric steel furnace in practice. *Iron Age* **79**, 332-336 (1907); *C. A.* **1**, 689 (1907).
- Electric furnace in iron and steel metallurgy. *Electrochem. Met. Ind.* **5**, 24 (1907).
- Electric furnace in the grey iron industry. *Can. Foundryman* **9**, 291-292 (1918).
- Electric furnaces in metallurgy. The Heroult furnace. *Electrician* **81**, 538, 608 (1918); *C. A.* **13**, 91.
- Electric furnace for pig iron. *Iron Trade Rev.* **55**, 521-522 (1914).
- Electric furnace pig iron at Trollhattan. *Met. Chem. Eng.* **10**, 413-416 (July, 1912).
- Electric furnace processes for iron and steel manufacture. *Electrochem. Ind.* **2**, 478-486 (1904).
- Electric iron and steel. *Elektrotech. Z.* **31**, 331; *C. A.* **4**, 1844.

- Electric iron and steel furnaces. *Engineering* **85**, 739-741, 775-777 (1909); *C. A.* **2**, 2507.
- Electric iron and steel industry in Canada and in Sweden and Norway. *Electrochem. Met. Ind.* **7**, 419 (1907).
- Electric iron ore smelting in Norway. *Elec. Rev. West. Elecn.* **67**, 54 (1915).
- Electric iron ore smelting in Norway. *Teknisk Ukeblad; Electrician* **70**, 292; *C. A.* **7**, 452.
- Electric iron smelting at Trollhattan. *Engineering* **94**, 395-397, 630-635; *C. A.* **7**, 1328.
- Electric pig iron in Norway—a new type of furnace using coke successfully. *Iron Age* **95**, 1120 (1915).
- Electric smelting of iron ores. *Can. Min. Rev.* **23**, 58-59 (1904).
- Electric smelting of iron ore. *Electrochem. Met. Ind.* **7**, 1 (1909); *C. A.* **3**, 1722.
- Electric smelting of iron ore. *Electrochem. Met. Ind.* **7**, 503 (1909); *C. A.* **4**, 864.
- Electric smelting of iron ore in California. *Electrochem. Met. Ind.* **5**, 318-9 (Aug., 1907); *Min. Sci. Press*, July 20, 1907.
- Electric smelting of iron ore in California. *Iron Age* **92**, 124-126 (1913).
- Electric smelting of iron ores in northern Sweden. *Iron Age* **100**, 605 (1917).
- Electric smelting of iron and steel. *Iron Coal Trades Rev.*, Jan. 15, 1904.
- Electric smelting in Sweden. *Iron Coal Trades Rev.; Iron Age* **84**, 545; *C. A.* **4**, 1427.
- Electric smelting in Sweden. *Electrician* **80**, 800 (1918); *C. A.* **12**, 1020.
- Electrochemical methods in the iron and steel industry, *Electrochem. Ind.* **1**, 235 (1903).
- Electrometallurgical industry of Sweden. *J. four elec.*, Dec. 1916; *C. A.* **11**, 1599.
- Electrometallurgical production of iron and steel. *Engineer, London*, **95**, 264-265 (Mar. 13, 1903).
- Electrometallurgy of iron and steel. *Electrochem. Ind.* **2**, 280-281 (1904).

- Electrometallurgy of iron and steel. *Rev. d'Electrochim.*, Oct., 1907.
- Electrometallurgy of iron and steel. *Elec. Eng.* **29**, 20; C. A. **4**, 1844.
- Electrometallurgy of iron and steel. *Trans. Am. Electrochem. Soc.* **15**, 237-254 (1909); C. A. **3**, 2537.
- Electro-production of iron and steel. *Engineer* **99**, 212-213 (March 3, 1905).
- Electrothermic iron ore smelting in Scandinavia. *Eng. Min. J.* **100**, 351-352 (1915); C. A. **9**, 2736.
- Elliott, G. K. Improving the quality of gray iron by the electric furnace. *Trans. Am. Electrochem. Soc.* **35**, 175-186 (1919); *Iron Age* **103**, 939-940 (1919); *Foundry* **47**, 585-586 (1919); C. A. **13**, 1045.
- Elwell, E. F. Refining of iron and steel in induction type furnaces. *Trans. Am. Inst. E. E.* **30**, 621; C. A. **5**, 1872.
- Engelhardt, V. Aims and limitations of the electrometallurgy of iron. *Oesterr. Chem. Ztg.* **17**, 100-107 (1914); C. A. **9**, 557.
- Electric furnace in the iron and steel industry. *Z. Ver. Deut. Ing.*, Nov. 19, 1910.
- Etchells, H. Application of the electric furnace to the metallurgy of iron and its alloys. *Electrician* **81**, 734-735 (1918); C. A. **13**, 284.
- Evans, J. W. Laboratory experiments in the electric smelting of iron ore. *Trans. Can. Min. Inst.* **9**, 128 (1906).
- Fielding, W. Formation of silicon sulfide in the desulfurization of iron. *Trans. Faraday Soc.* **5**, 110; C. A. **5**, 147.
- FitzGerald, F. A. J. Experiments on smelting in the induction furnace. *Electrochem. Met. Ind.* **7**, 10 (1909); C. A. **3**, 1722.
- Treatment of iron and steel in the electric furnace. *Electrochem. Met. Ind.* **6**, 353 (1908); C. A. **2**, 3031.
- Floge, A. New experience with the electric furnace in the iron and steel industry. *Chem. Ztg.* **36**, 307; C. A. **7**, 1843.
- Francois, L., and Tissier, L. Electrometallurgy in the iron industry. *Revue technique*, May 10, 1904.
- Foundry pig iron smelted in electric furnaces. *Iron Trade Rev.* **53**, 493-497 (Sept. 18, 1913).



- Frank, K. G. Progress in the iron and steel industry and the electric furnace. *Proc. Am. Inst. E. E.* **34**, 2547-2554 (1915); *C. A.* **9**, 3028.
- Frick, O. Electric reduction of iron ores. *Met. Chem. Eng.* **9**, 631-637 (1911); **10**, 71 (1912); *Elec. World* **58**, 1432; *C. A.* **6**, 714.
- Results with a Rennerfelt furnace. *Iron Age* **101**, 563 (1918); *C. A.* **13**, 536.
- Geillenkirchen, Th. Desulfurization of iron in the Kjellin induction furnace. *Stahl u. Eisen* **28**, 1180; *C. A.* **3**, 1618.
- Desulfurization in the Heroult furnace. *Stahl u. Eisen* **28**, 873-876; *C. A.* **2**, 2667.
- Gin, G. Electrical reduction of titaniferous iron ores. *Trans. Am. Electrochem. Soc.* **11**, 291-294 (1907); *C. A.* **2**, 57.
- Goldschmidt, H. Manufacture of iron and steel in the electric furnace. *Electrochem. Ind.* **1**, 461-462 (1902).
- Production of iron and steel in the electric furnace. *Elec.*, London, **52**, 163-167 (Nov. 20, 1903).
- Gorow, R. C. Electric furnace in the foundry. *Met. Chem. Eng.* **13**, 882-883 (1915); *C. A.* **10**, 853.
- Gradenwitz, Alfred. New resistance and induction furnace. *Eng. Min. J.* **87**, 364-365; *C. A.* **3**, 1120.
- Greaves-Etchells electric furnace. *Elec. Rev. (London)* **80**, 395-396 (1917); *C. A.* **12**, 789.
- Greene, A. E. Electric heating and the removal of phosphorus from iron. *Trans. Am. Inst. Min. Eng.* **74**, 269-277; *Trans. Am. Electrochem. Soc.* **22**, 123-131 (1912); *C. A.* **7**, 2159.
- and McGregor, F. S. Electrothermic reduction of iron ores. *Trans. Am. Electrochem. Soc.* **12**, 65-79 (1907); *C. A.* **2**, 1526; *Electrochem. Met. Ind.* **5**, 367-371 (1907); *C. A.* **2**, 629.
- Guarini, Emile. Electro-metallurgy of iron and steel. *Sci. Am. S.* 23895-6, 23904-5, 23918-20 (1904).
- Guillet, L. Present state of the electrometallurgy of iron and steel. *Génie Civil* **50**, 89, 105, 124, 140, 156, 174 (1906).
- Haanel, E. Electric shaft furnace of the Aktiebolaget Electrometall, Ludviga, Sweden. *Trans. Am. Electrochem. Soc.* **15**, 25-34 (1909); *Electrochem. Met. Ind.* **7**, 251 (1909); *C. A.* **3**, 2533.

- Electric smelting of iron ore. *Electrochem. Met. Ind.* **4**, 265-268 (1906).
- Electric smelting of magnetic ores. *Iron Steel Mag.* **11**, 401-410 (1906); *Can. Eng.* **13**, 140-144 (Apr., 1906).
- Experiments made at Sault Ste. Marie under Government auspices in the smelting of Canadian ores by the electrothermic process. *Trans. Faraday Soc.* **2**, 120-136 (1907); *C. A.* **1**, 820; *Elektrochem. Z.*, Apr., 1907.
- Investigation of an electric shaft furnace. Canada, Dept. Interior, Mines Branch, Report 32 (1909); *C. A.* **3**, 2533, 2906.
- Iron reduction at the "Soo" by the Heroult electric furnace process. *Electrochem. Met. Ind.* **4**, 124-126 (1906).
- Pig iron production in an electric shaft furnace. *Iron Age* **84**, 831-836; *C. A.* **3**, 2533; **4**, 1844.
- Recent advances in electric smelting. Canada, Dept. Interior, Mines Branch, Bull. **3**, 1910.
- Report of the commission appointed to investigate the different electrothermic processes for the smelting of iron ores and the making of steel in operation in Europe. Canada, Dept. Interior, Mines Branch. 1904.
- Report on the experiments made at Sault Ste. Marie, Ontario, under Government auspices, on smelting Canadian iron ores by the electrothermic process. Canada, Dept. Interior, Mines Branch. 1907.
- Smelting of Canadian ores by the electrothermic process. *Trans. Faraday Soc.*, July 2, 1906.
- Hansen, C. A. Small experimental Heroult furnace. *Electrochem. Met. Ind.* **7**, 206-208 (1909); *C. A.* **3**, 1722.
- Hanson, H. J. Smelting iron electrically with coke as fuel. *Iron Trade Rev.* **53**, 1003-1007 (1913).
- Harbord, F. W. Electrometallurgy of iron and steel before the Faraday Society. *Electrochem. Met. Ind.* **3**, 218-220 (June, 1905).
- Recent developments in electric smelting in connection with iron and steel. *Trans. Faraday Soc.* **1**, 140 (1905); *Iron Coal Trades Rev.*, Mar. 10, 1905.
- and Haanel, E. Electric processes for iron and steel manufacture. *Electrochem. Ind.* **2**, 486-497 (1904).

- Harden, J. Dephosphorization and desulfurization in the electric furnace. *Engineer* **86**, 205-206; *C. A.* **2**, 2906.
- Efficiency of induction furnaces. *Electrochem. Met. Ind.* **7**, 320 (1909); *C. A.* **3**, 2085.
- Electric iron ore smelting at Hardanger, in Norway. I, II, III. *Met. Chem. Eng.* **12**, 82-86, 223, 280 (1914); *Electrician* **52**, 766-771; *C. A.* **8**, 1237 (1916).
- Electric iron smelting at Hardanger, in Norway. *Met. Chem. Eng.* **12**, 444-446 (1914); *C. A.* **8**, 3532.
- Electric smelting and reduction of iron ores in England. *Electrician* **58**, 467-9 (1911).
- Induction furnace notes. *Met. Chem. Eng.* **11**, 559-562 (1913); *C. A.* **8**, 298.
- Recent developments of the Kjellin and Rochling-Rodenhäuser furnaces. *Trans. Faraday Soc.* **4**, part 2, 120; *Eng.* **86**, 45; *C. A.* **3**, 286; *Chem. News* **98**, 29-31; *C. A.* **2**, 3195.
- Smelting of iron ores in the electric furnace in comparison with blast furnace products. *Electrochem. Met. Ind.* **7**, 16 (1909); *C. A.* **3**, 1722.
- Utilization of manganese ores in Sweden. *Met. Chem. Eng.* **17**, 701-704 (1917); *C. A.* **12**, 452.
- Helfenstein-Engelhardt. Large electric furnace for pig iron. *Montan. Rundsch.* **7**, 110 (1915); *C. A.* **10**, 853.
- Henry N. New electric furnace for the extraction of iron. *L'Electricien* **38**, 132-134 (1909); *C. A.* **3**, 2776.
- Present status of the electrometallurgy of iron. *L'Electricien* **38**, 97, 115 (1909); *C. A.* **3**, 2652.
- Hering, Carl. Elementary principles of the designing and proportioning of electric furnaces. *Met. Chem. Eng.* **8**, 471 (1910); *C. A.* **5**, 429.
- Heroult, P. L. T. Electric metallurgy of iron and steel. *Electrochem. Ind.* **2**, 408-409 (1904); *Trans. Am. Electrochem. Soc.* **6**, 129-134 (1904).
- Hess, J. Electrometallurgy of iron and the iron alloys. *Z. Elektrochemie* **12**, 25-31, 231-242 (1906).
- Hooghwinkel, G. Electric furnace in the iron and steel industry. *Electrician* **55**, 307 (1910); *C. A.* **4**, 2070.
- Huellegard, H. Electric pig iron plant in Sweden. *Electrochem. Met. Ind.* **7**, 300 (1909); *C. A.* **3**, 2085.



Hutton, R. S. The electric furnace and its application to the metallurgy of iron and steel. *Engineering*, Dec. 7, 1906; *C. A.* **1**, 689.

Recent advances in the electrometallurgy of iron and steel. *J. Soc. Chem. Ind.* **24**, 589-592 (1905); *Eng. Min. J.* **80**, 771-2 (Oct. 28, 1905).

Igewsky. Foundry electric furnaces. *L'Electricien* **37**, 231; *C. A.* **3**, 1493.

Irresberger, Carl. The electric smelting furnace of Gronwall-Dixon. *Stahl u. Eisen* **38**, 90-92 (1918); *C. A.* **13**, 283.

Johnson, W. M. Electrometallurgy of iron and steel. *Met. Chem. Eng.* **12**, 165 (1914); *C. A.* **8**, 1915.

Two stage electric smelting of iron ore. *Iron Age* **90**, 450-451 (Aug. 29, 1912).

Juliusburger. Electrometallurgy of iron and steel. *Elek. Kraft u. Bahnen* **8**, 643-646 (Nov. 14, 1910).

Kalmus, H. T. Recent developments in the electrothermic production of iron and steel, 1911-1912. Canada, Dept. of Mines, Mines Branch, 1912, pp. 107-120.

Keeney, R. M. Fluorspar in electric smelting of iron ores. *Min. Sci. Press* **109**, 335-336 (Aug. 29, 1914); *C. A.* **8**, 3396.

and Lyon, D. A. Possible application of the electric furnace to Western metallurgy. *Trans. Am. Electrochem. Soc.* **24**, 118-166 (1913); *Met. Chem. Eng.* **11**, 577-581 (1913).

Keller, C. A. Electric furnaces as applied in the manufacture of iron and steel. *Trans. Am. Electrochem. Soc.* **15**, 87-126 (1909); *Electrochem. Met. Ind.* **7**, 255-259 (1909); *Trans. Faraday Soc.* **5**, 110-136; *C. A.* **4**, 20; *Electrician* **63**, 452-455 (1909); *C. A.* **3**, 2269; *Iron Coal Trades Rev.*, June 18, 1909. Electrothermics of iron and steel. *Trans. Faraday Soc.* **2**, 36 (1906); *Iron Coal Trades Rev.*, Apr. 13, 1906.

Synthetic electric furnace cast iron. *Trans. Am. Electrochem. Soc.* **37**, Preprint 2, 17-34 (1920).

Kershaw, J. B. C. Electric furnaces for the iron and brass foundry. *Elec World* **51**, 856-858; *C. A.* **2**, 1781.

Electric furnace methods of iron production. *Iron Trade Rev.* **50**, 41-46 (Jan. 4, 1912).



- Electric furnace methods of iron and steel production. *Elec. Rev.* **42**, 793-794, 842-845 (1903); *Iron Trade Rev.* **39**, 21 (June 28, 1906) and following numbers; **39**, 27 (Nov. 29, 1906); **40**, 30 (Jan. 3, 1907).
- Kjellin, F. A. The Kjellin and Roechling-Rodenhauser electric furnace. *Trans. Am. Electrochem. Soc.* **15**, 173-204 (1909); *Electrochem. Met. Ind.* **7**, 265-266; *C. A.* **3**, 2536.
- Knudsen. The electrometallurgical industries of Scandinavia. *J. four. elec.* **28**, 17-18 (1919); *C. A.* **13**, 930.
- Kroupa, G. Smelting iron ores in the electric shaft furnace. *Oesterr. Z. Berg-Hüttenw.* **59**, 502-507, 513-520; *C. A.* **5**, 3197; *C. A.* **6**, 1402.
- LeChatelier, C. Electrometallurgy of iron. *Rev. métal* **4**, 85, 109 (1908); *C. A.* **2**, 1815.
- Leffler, J. A. Electric iron ore smelting in Sweden. *Electrician* **75**, 729 (1915); *Engineering* **100**, 131-133 (1915); *C. A.* **9**, 2736, 3029.
- Electric iron smelting at Trollhattan, Sweden. *Iron Coal Trades Rev.*, June 9, 1911.
- Electric pig iron and steel plant at Trollhattan, Sweden. *Engineering* **92**, 374-379; *Met. Chem. Eng.* **9**, 505-510; *C. A.* **5**, 3655,
- and Nystrom, E. Electric furnace pig iron at Trollhattan. *Met. Chem. Eng.* **10**, 413; *C. A.* **6**, 2890.
- and Odelberg, E. Electric iron ore smelting at Trollhattan. *Engineering* **91**, 778, 811, 846; *Met. Chem. Eng.* **9**, 368-371, 459-463; *Eng. Mag.* **41**, 846; *C. A.* **5**, 3197.
- Ljungberg, E. J. Production of iron and steel by the electric smelting process. *Electrician* **63**, 990; *Engineering* **88**, 465; *Elec. Rev.* **65**, 575; *C. A.* **4**, 21.
- Louden, T. R. The electric smelting of iron ores in Canada. *Appl. Sci.* **8**, 219-223 (1914); *C. A.* **9**, 23.
- Notes on the electrometallurgy of iron and steel. *Appl. Sci.* **4**, n. s. 10-18 (Nov., 1910).
- Luchini, V. Manufacture of iron in the electric furnace by the Stassano process. *Soc. chim. di Milano*; *J. Soc. Chem. Ind.* **20**, 816; **21**, 1143.

- Lyman, James. Electric furnaces in the manufacture of iron and steel. *Chem. Eng.* **13**, 250; *C. A.* **5**, 3197; *Trans. Am. Electrochem. Soc.* **19**, 193-203 (1910).
- Lyon, D. A. Electric furnace in the production of pig iron from ore. *Met. Chem. Eng.* **11**, 15-19 (1913); *Sci. Am. S.* **75**, 381-383 (1913); *C. A.* **7**, 936.
- Iron reduction in the electric furnace. *Electrochem. Met. Ind.* **6**, 139 (1908); *C. A.* **2**, 1781.
- Use of electric furnace pig iron in the open hearth furnace. *Met. Chem. Eng.* **10**, 539 (1912).
- McClure, W. The production of iron and steel by the electric furnace. *Eng. Rev.*, Dec., 1904.
- McKnight, W. M. Faults of the small electric arc furnace. *Iron Age* **97**, 1008 (1916); *J. Elec. Power Gas* **36**, 376 (1916).
- Stassano electric furnace at Redondo. *J. Elec. Power Gas* **35**, 37 (1915); *C. A.* **9**, 2486.
- Marchand, H. The electric blast furnace. *Rev. chim. ind.* **21**, 84; *C. A.* **4**, 1844.
- Electric shaft furnace. *Rev. gén. sci.* **21**, 270; *C. A.* **4**, 3165.
- Recent experiments on the electrothermal treatment of iron minerals. *Rev. gén. sci.* **20**, 443-451; *C. A.* **3**, 2269.
- Marshall, A. H. Use of electricity and its bearing on fuel saving in the iron and steel trades. *Electrician* **80**, 550-551 (1918); *C. A.* **12**, 467.
- Mercer, R. G. Electric furnaces in the United Kingdom, 1918. *Electrician* **82**, 694-696 (1919); *C. A.* **13**, 1792.
- Merrick, C. B. Saving the waste with an electric furnace. *J. Elec.* **42**, 30 (1919); *C. A.* **13**, 931.
- Minet, A. The manufacture of iron by electrochemical processes. *Eng. Mag.* **27**, 796-816 (Aug. 6, 1904).
- Moldenke. Electrometallurgical memoranda of the iron industry. *Iron Trade Rev.* **31**, 12-13 (Apr. 21, 1898).
- Morrison, W. L. Electric smelting of the Pacific Coast. *J. Elec.* **42**, 67 (1919); *C. A.* **13**, 932.
- Nau, J. B. New process for the refining of pig iron. *Met. Chem. Eng.* **9**, 127-130 (1911); *C. A.* **5**, 2032.

- Neuberger, A. Development of the electric smelting of iron and steel. Glaser's Annalen, Mar. 15, 1906.
- The electrometallurgy of iron and steel. Glückauf. **41**, 607-614 (May 13, 1905).
- Manufacture of iron and steel by electrical process. Z. angew Chem. **17**, 104-112, 129-140 (1904); J. Soc. Chem. Ind. **23**, 258; Glaser's Ann., Nov. 15, Dec. 1, 1904.
- and Minet, A. The Neuberger-Minet electric furnace for the production of iron and steel. Mining J., Dec. 31, 1904.
- Neumann, B. Electric furnace methods in iron and steel manufacture in comparison with the ordinary metallurgical process. Electrochem. Ind. **2**, 488-490 (1904).
- The electric smelting of iron and iron alloys. Stahl u. Eisen **24**, 682-688, 761-769, 821-6, 883-8, 944-50 (1904).
- Electrometallurgy of iron. Monographien über angewandte Elektrochemie. No. 26 (1907).
- Manufacture of pig iron in the electric furnace. Stahl u. Eisen **27**, 1256-1263 (1907); C. A. **1**, 2993.
- Materials and thermal balance of the electric pig iron furnace. Stahl u. Eisen **35**, 1152-1158 (1915); Iron Age **97**, 834 (1916); C. A. **10**, 1813.
- New results from the electric smelting of iron in the experimental plant at Trollhattan. Stahl u. Eisen **32**, 1409-1416.
- Note on the desulfurizing of iron in the electric furnace. Stahl u. Eisen **29**, 355-356; C. A. **5**, 629.
- Operative results of some electric iron and steel processes. Stahl u. Eisen **25**, 536-43 (May 1, 1905).
- Pig iron production in the electric furnace at Domnarfvet, Sweden. Stahl u. Eisen, **29**, 1801-14 (Nov. 17, 1909).
- Production of pig iron in the electric furnace. Stahl u. Eisen **27**, 1256-63 (Aug. 28, 1907).
- Production of pig iron in the electric furnace at Domnarfvet. Z. Elektrochem. **16**, 165-169; C. A. **4**, 2607.
- Roechling-Rodenhauser induction furnace for 3-phase currents. Metal Ind. **6**, 45-48; C. A. **3**, 147.
- New induction furnace. Iron Age **103**, 1294-1295; C. A. **13**, 1561.

- New installations of Heroult electric furnace. *Iron Age* **96**, 337 (1915); C. A. **9**, 2487.
- Nicou, Paul. Production of cast iron in the electric furnace in Sweden; an account of experiments at Trollhattan. *Rev. métal.* **9**, 202-252; C. A. **6**, 3361.
- Odelberg, E. Behavior and qualities of the electric furnace pig iron in the open hearth process. *Met. Chem. Eng.* **9**, 508-510 (1911); C. A. **6**, 1097.
- Odquist. Problem of electric ore smelting in Norway. *Elec. Rev. West. Elec.* **64**, 100; C. A. **8**, 867.
- Oesterreich, Max. Large Helfenstein electric furnace. *Iron Age* **91**, 1482; *Stahl u. Eisen* **33**, 305-311.
- Orten-Boving, J. Electric iron smelting. *Can. Eng.*, Dec. 18, 1913.
- Osann, B. Desulfurization of iron in the electric induction furnace. *Stahl u. Eisen* **28**, 1017-1023; *Engineering* **36**, 148; C. A. **2**, 2906.
- Ingot iron from the electric furnace. *Iron Coal Trades Rev.*, Nov. 6, 1918.
- Perkins, F. C. Stassano electric furnace. *Mines and Minerals* **29**, 277; C. A. **3**, 1246.
- Petinot, N. Electric furnace in the foundry. *Met. Chem. Eng.* **13**, 650 (1915); C. A. **10**, 853.
- Pig iron from scrap steel. *Min. Sci. Press* **115**, 936-937 (1917); C. A. **12**, 790.
- Production of pig iron in the electric furnace. *Elec. Rev. (London)* **71**, 44-45 (July 12, 1912).
- Prentiss, F. L. Uses of electricity in malleable foundry. *Iron Age* **103**, 537-43 (1919); C. A. **13**, 931.
- Report of the Canadian commission on electrothermic processes for the production of iron. *Elec. Rev.* **45**, 928-930 (Dec. 3, 1904).
- Rice, S. Experiments in electrical melting of iron ores. *Min. Eng. World* **36**, 811-814; C. A. **6**, 2033.
- Richards, J. W. Electric furnace production of pig iron and pig steel. *Proc. Eng. Soc. W. Penn.*, Mar., 1912.



- Electric furnace reduction of iron ore. *Trans. Am. Electrochem. Soc.* **15**, 53-62; *Electrochem. Met. Ind.* **7**, 253-254 (1909); *C. A.* **3**, 1723, 2408; *Eng. News* **61**, 559; *Iron Trade Rev.* **44**, 899-906 (1909).
- Electrical reduction of iron ores. *J. Franklin Inst.* **169**, 131 (1910); *C. A.* **4**, 1427.
- Electric reduction of iron ores. *Chem. Eng.* **9**, 175; *C. A.* **8**, 2085.
- Electrometallurgical revolution in the iron and steel industry of Norway and Sweden. *Proc. Eng. Soc. W. Penn.* **27**, 125 (1911); *C. A.* **5**, 3655.
- Experiments at Sault Ste. Marie on the electrical reduction of iron ores. *Trans. Am. Electrochem. Soc.* **12**, 81-95 (1907); *C. A.* **2**, 1412.
- Gas circulation in electric reduction furnaces. *Trans. Am. Electrochem. Soc.* **21**, 403-407 (1912).
- Metallurgical calculations. *Electrometallurgy of iron and steel. Electrochem. Met. Ind.* **5**, 165 (1907).
- Robertson, T. D. Electrical iron smelting in Sweden. *Iron Age* **88**, 804-807 (Oct. 12, 1911).
- Iron and steel melting in electro-metal furnaces. *Electrician* **70**, 501-504 (1912); *C. A.* **7**, 730.
- Recent developments in electric iron smelting. *Appl. Sci.* **6**, 138-148 (Feb., 1912).
- Recent progress in electrical iron smelting in Sweden. *Trans. Am. Electrochem. Soc.* **20**, 375-401 (1911); *C. A.* **6**, 29.
- Rodenhauser, W. Advances in the construction and operation of electric blast furnaces. *Elek. Kraft u. Bahnen* **11**, 561-566 (Sept. 24, 1913).
- Improvements in the electric furnace and new fields of application in iron smelting. *Chem. Ztg.* **36**, 1294-1295; *C. A.* **7**, 730.
- Rossi, A. J. Electric furnace in the iron and steel industry. *Electrochem. Met. Ind.* **3**, 53-54 (1905).
- Electric smelting of iron ore. *Iron Age*, Nov. 20, 1902.
- Utilization of blast furnace gases in connection with the electric smelting of iron. *Trans. Am. Electrochem. Soc.* **7**, 199 (1905).

- Rowlands, L. Induction furnace practice. *Trans. Am. Electrochem. Soc.* **17**, 103-130 (1910); *Met. Chem. Eng.* **8**, 337; *C. A.* **4**, 2768.
- Ruthenberg, M. Advances in metallurgy of iron production. *Trans. Am. Electrochem. Soc.* **4**, 19-30 (1903).
- Recent developments in the electrometallurgy of iron and steel. *Electrochem. & Met.* **2**, 12-20 (Mar., 1902).
- Ruthenberg electric iron process. *Iron Age* **70**, 5-6 (Sept. 25, 1902); *Trans. Am. Electrochem. Soc.* **2**, 92-103 (1902).
- The smelting of iron ores and the production of steel in the electric furnace. *Electrochem. Ind.* **1**, 202-3 (1903).
- Sawhill, R. V. Melting all scrap in Ludlum electric furnace. *Foundry* **45**, 399-405 (1917); *Iron Trade Rev.* **61**, 437-443 (1917).
- Schmidt, A. Desulfurization of iron in the Kjellin induction furnace. *Stahl u. Eisen* **27**, 1613-1615 (1907); *C. A.* **2**, 392.
- Schneider, A. F. Electrometallurgy of iron and steel. *Min. Mag.* **10**, 109-116 (Aug., 1904).
- Scott, E. K. Electric furnace in iron and brass foundries. *Foundry* **41**, 379-381 (1913).
- Sebillot, A. Water-jacketed electric blast furnace. *J. four. elec.* **27**, 215 (1918); *C. A.* **13**, 813.
- Sifton, Clifford. Electric furnace in Canada. *Electrician* **80**, 674 (1918); *C. A.* **12**, 651.
- Simpson, I. Reduction of iron ores by the electrothermic process. *Bull. Can. Min. Inst.* **87**, 709-713 (1919); *C. A.* **13**, 2486.
- Simpson, Louis. Electric reduction of iron ores and the conversion of iron into steel in an electric furnace. *Electrochem. Ind.* **1**, 277-278, 336-7, 397 (1903).
- Sjostedt, E. A. Electric smelting of iron ores at Domnarfvet and at Nykroppa. *Met. Chem. Eng.* **8**, 8; *C. A.* **4**, 864.
- Smith, John J. Manufacture of pig iron in the electric furnace. *Met. Chem. Eng.* **9**, 624-625; *C. A.* **6**, 1097.
- Stansbie, J. H. Electric smelting of iron and steel. *Iron Coal Trades Rev.*, Nov. 4, 1904.
- Stansfield, A. Electric smelting of iron ores. *Bull. Can. Min. Inst.* **87**, 706-709 (1919); *C. A.* **13**, 2486.

- Electric smelting of iron ores in British Columbia. Eng. Min. J. **107**, 224 (1919); Chem. Met. Eng. **20**, 630-636 (1919); Iron and Steel of Canada **2**, 132-145 (1919); Can. Min. J. **40**, 54-56 (1919); British Columbia Dept. of Mines, Bull. No. 2; C. A. **13**, 684.
- Electric smelting possibilities in British Columbia. Elec. Rev. **74**, 805 (1919); C. A. **13**, 1424.
- Electrothermic production of iron and steel. Can. Soc. Civ. Engrs., March, 1904.
- Electrothermic smelting of iron ores in Sweden. Canada Dept. of Mines, Mines Branch, Bull. 344. 57 pp. (1915); C. A. **10**, 314.
- Possibilities in the electric smelting of iron ores. J. Can. Min. Inst. **11**, 180-188 (1908); Can. Min. J., Apr. 1, 1908.
- Production of pig iron from iron ore, carbon and flux. Can. Eng. **13**, 437 (1906).
- Stanley, G. H. Electric furnace manufacture of shoes and dies on the Wilwater strand. J. Chem. Met. Soc. S. Africa **18**, 72-83 (1917); C. A. **12**, 1729.
- Stassano, S. E. Application of the electric furnace to siderurgy. Trans. Am. Electrochem. Soc. **15**, 63-86 (1909); Electrochem. Met. Ind. **7**, 254-255 (1909); C. A. **3**, 2534.
- The electrometallurgy of iron. Elektrochem. Z. **18**, 173; **19**, 199; C. A. **1**, 689; Elec'n. (London) **57**, 810-814 (Sept. 7, 1906); Sci. Am. S. 25888-25890 (Dec. 22, 1906).
- Electrometallurgy of iron. Rev. métal. **5**, 575-598 (Sept., 1908).
- Reduction of iron ore and steel refining in the electric furnace. Electrochem. Met. Ind. **7**, 107-108 (1909); C. A. **3**, 1494.
- Treatment of iron and steel in the electric furnace. Electrochem. Met. Ind. **6**, 315-321 (1908); C. A. **2**, 2651.
- Stassano electric furnace. Iron Age **82**, 990-992; C. A. **3**, 147.
- Stoughton, E. A. Manufacture of iron and steel in the electric furnace. J. Franklin Inst. **167**, 73-87 (1909); C. A. **4**, 865.
- Styri, H. Electric furnace in the development of the Norwegian iron industry. Trans. Am. Electrochem. Soc. **32**, 129-141 (1917).

- Sude, J. A. Manufacture of iron and steel in the electric furnace. *Chem. Eng.* **11**, 164; *C. A.* **4**, 2234.
- Taylor, E. R. Contribution to the electric smelting of iron ore. *Trans. Am. Electrochem. Soc.* **16**, 229-234 (1909); *C. A.* **4**, 2607; *Iron Trade Rev.* **46**, 141-8 (1910).
- Electric furnace for the smelting of iron ore. *Trans. Am. Inst. Chem. Eng.* **2**, 280-299 (1909).
- Thieme, H. Electric furnaces and their application in the iron and steel industry. *Giesserer Zeit.*, Sept. 15, 1911.
- Turnbull, R. Electric pig iron in war times. *Trans. Am. Electrochem. Soc.* **32**, 119-128 (1917); *Iron Age* **100**, 886-887, 870; *Iron Trade Rev.* **61**, 828-829; *Met. Chem. Eng.* **17**, 459-460 (1917); *C. A.* **11**, 3177.
- Electric pig iron after the war. *Trans. Am. Electrochem. Soc.* **34**, 143-148 (1919); *Met. Chem. Eng.* **20**, 178-179 (1919); *C. A.* **13**, 1672.
- Electric pig iron from steel scrap. *Iron Age* **102**, 1026-1027 (1918); *C. A.* **40**, 191-192.
- Heroult electric furnace. *Trans. Am. Electrochem. Soc.* **15**, 139-148 (1909); *Electrochem. Met. Ind.* **7**, 260-263 (1909); *C. A.* **3**, 2535.
- Reduction of iron ores in the electric furnace. *Quart. Bul. of Can. Min. Inst.*, May, 1908.
- Tyssowski, J. Electric smelting of iron ore at Heroult, Cal. *Eng. Min. J.*, Aug. 6, 1910.
- Use of electricity in the metallurgy of iron. *Sci. Am. S.* **71**, 204-205 (Apr. 1, 1911).
- Van Langendonck, C. Helfenstein large electric furnace. *Iron Age* **94**, 478-480; *Iron Trade Rev.* **55**, 521-522; *C. A.* **8**, 3396.
- Van Norden, R. W. Electric iron smelting at Heroult on the Pit. *J. Elec. Power Gas* **29**, 453-460 (1912); *Elec. Rev. West. Elec.* **61**, 1134; *C. A.* **7**, 937.
- Vom Baur, C. H. First combination induction furnace in operation in the United States. *Met. Chem. Eng.* **11**, 113-114 (1913); *C. A.* **7**, 1443.
- Rennerfelt electric furnace operations. *Trans. Am. Electrochem. Soc.* **31**, 111-115 (1917); *Iron Age* **99**, 1206-1207; *C. A.* **11**, 1791.



- Vom Baur electric furnace. *Trans. Am. Electrochem. Soc.* **33**, 237-247 (1918); *C. A.* **12**, 1360.
- Wedding, H. The electric induction furnace of Rochling-Rodenhauser. *Stahl u. Eisen* **27**, 1605-1612 (1907); *C. A.* **2**, 393.
- Wolff, R. H. Electric furnace for rail and ordnance steel. *Electrochem. Met. Ind.* **6**, 485-6 (1908); *C. A.* **3**, 1618.
- World's electrical iron and steel furnaces. *Min. Eng. World*, Aug. 26, 1911; *J. Soc. Chem. Ind.* **30**, 1121 (1911).
- Yngstrom, L. Electric blast furnace at Domnarfvet, Sweden. *Met. Chem. Eng.* **8**, 11-17 (1910).
- Electric production of iron from iron ores at Domnarfvet, Sweden. *Engineering (London)* **109**, 206, 234 (1910).
- Electric production of pig iron. *Engineering* **88**, 414; *C. A.* **4**, 146.

### STEEL.

- Abell, O. J. New steel foundries using electric furnaces. *Iron Age* **91**, 1288; *C. A.* **7**, 3274.
- Amberg, R. Deoxidation and desulfurization in electric steel furnaces. *Electrochem. Met. Ind.* **7**, 115 (1909); *C. A.* **3**, 1494.
- The function of slag in electric steel refining. *Orig. Com.* 8th Intern. Cong. Appl. Chem. **21**, 7-23; *Trans. Am. Electrochem. Soc.* **22**, 133-148 (1912); *Met. Chem. Eng.* **10**, 601 (1912); *C. A.* **6**, 3361.
- Some features of the electric steel furnace in regard to deoxidation and desulfurization. *Stahl u. Eisen* **29**, 176-178; *C. A.* **4**, 2070.
- Temperatures in electric steel refining. *Met. Chem. Eng.* **8**, 314-315 (1910); *C. A.* **4**, 2234.
- Anderson, T. S. Electric furnace in steel making and copper melting. *Eng. Min. J.* **83**, 1231-2 (June 29, 1907).
- Arc furnaces for steel making. *Iron Coal Trades Rev.*, Jan. 20, 1917.
- Arnou, G. Electric steel direct from the ore. *Lumière elec.* **13**, 304-311; *Rev. métal* **7**, 1190-1200; *Engineer* **91**, 834; *C. A.* **5**, 1872.
- Notes on electric steel. *Rev. métal* **7**, 1054-1058; *C. A.* **5**, 2369.

Baily, T. F. An electric furnace for heating bars and billets. *Trans. Am. Electrochem. Soc.* **19**, 285-298 (1911); **21**, 419-424 (1912).

Annealing and heat treatment of steel and melting of non-ferrous metals in the electric furnace. *J. Clev. Eng. Soc.* **10**, 81-92 (1917); *C. A.* **12**, 251.

The electric furnace as a soaking pit in the steel mill. *Iron Age* **97**, 311 (1916); *C. A.* **10**, 853.

Bennie, P. McN. Electrical manufacture of steel. *Process of Gin. Electrochem. Ind.* **2**, 20-24 (1904).

Manufacture of steel by the electric furnace. *Iron Age*, Dec. 11, 1902; *Sci. Am. S.*, Aug. 1, 1903, 23058-23060.

Bethlehem's new electric steel plant. *Iron Age* **97**, 1194-1195 (1916); *C. A.* **10**, 2071.

Bian, E. Electric steel practice in a German works. *Iron Coal Trades Rev.*, June 2, 1911.

Electric steel works of the Eicher Smelting Works, La-Gallais, Metz & Co. *Stahl u. Eisen* **31**, 217-224 (1911); *Electrician*, Apr. 14, 1911; *C. A.* **5**, 3377.

Bianchetti, G. Notes on the Kjellin electric furnace in steel manufacture. *Industria*, May 4, 1913.

Bibby, J. Electric steel refining furnace. *Trans. Faraday Soc.* **14**, 78-89 (1919); *Engineering* **107**, 649-654; *C. A.* **13**, 1423.

Biffi, E. Electric furnace in the manufacture of steel. *Monit. Tecn.*, Aug. 10, 1911.

Bjorkstedt, Wm. The induction furnace, its efficiency and refining capabilities. *Met. Chem. Eng.* **12**, 146-147 (1914); *C. A.* **8**, 2112.

Booth, W. K. The Booth-Hall electric furnace. *Trans. Am. Electrochem. Soc.* **33**, 247 (1918); *C. A.* **12**, 1360; *Electrician* **82**, 588-589 (1919); *C. A.* **13**, 1672.

Electric furnace steel. *J. Am. Steel Treathers' Soc.* **1**, 207-214 (1919).

Booth-Hall electric steel furnace. *Met. Chem. Eng.* **18**, 211-212 (1918); *Iron Age* **101**, 45-47; *Iron Trade Rev.* **62**, 162-163; *C. A.* **12**, 451.

Borchers, W. Electric smelting with the Girod furnace. *Trans. Am. Inst. Min. Eng.* **41**, 120 (1910).

- Bowman, R. G., and Dittus, E. J. Direct production of molybdenum steel in the electric furnace. *Trans. Am. Electrochem. Soc.* **20**, 355 (1911).
- Buchanan, W. Electric steel melting plant. *J. Chem. Met. Soc. South Africa* **18**, 83-87 (1917); *C. A.* **12**, 1729.
- Buck, C. A. The Bethlehem 10-ton Girod steel furnace. *Trans. Am. Electrochem. Soc.* **31**, 81-86 (1917); *C. A.* **11**, 1791.
- Burgess, C. F. Electrolytic refining as a step in the production of steel. *Trans. Am. Electrochem. Soc.* **19**, 181 (1911).
- Campbell, D. F. Electric steel refining. *Electrician* **65**, 1056; *Chem. Eng.* **12**, 149-151; *J. Iron Steel Inst.* **82**, 197 (1910); *C. A.* **5**, 429.
- Canada's electric steel plant at Toronto. *Iron Age* **101**, 1053-1057 (1918); *Elec. Rev.* **73**, 177-178 (1918).
- Catani, R. Application of electricity in the metallurgy of steel. *J. Iron Steel Inst.* **84**, 215 (1911); *Met. Chem. Eng.* **9**, 642 (1911).
- Direct production of steel from minerals by means of the electric furnace. *Rass. Min.* **35**, 211-213, 258-261, 276-279.
- Production and refining of steel in the electric furnace. *Riv. Marit.*, April, 1910.
- Changing the voltage of electric steel furnace by variable transformer connection. *Elec. Rev. West. Elec.* **72**, 636-637 (1918); *C. A.* **12**, 1020.
- Chetwynd electrical purification process. *Engineering* **99**, 283-284 (1915); *C. A.* **9**, 1150.
- Churchill, F. A. Seattle electric steel foundry. *Iron Trade Rev.* **55**, 1043-1045, 1050 (1914); *C. A.* **9**, 557.
- Clark, E. B. Electric furnaces for steel making. *Trans. Am. Electrochem. Soc.* **25**, 139-160 (1914); *Chem. Eng.* **19**, 157-159; *Iron Age* **93**, 1007-1009 (1914); *Met. Chem. Eng.* **12**, 336-337 (1914); *C. A.* **8**, 2113.
- Various types and applications of electric steel furnaces. *Met. Chem. Eng.* **10**, 373 (1912); *C. A.* **6**, 2360.
- Clark, Geo. T., and Phillips, F. World's largest electric steel plant in Toronto. *Can. Eng.* **36**, 327-331 (1919).
- Cogswell, W. H. Electric furnace steel. *Elec. J.* **14**, 142-143 (1917); *C. A.* **11**, 1599.

- Combined Bessemer and electric furnace. *Elec. Rev. West. Elec.* **59**, 648; *C. A.* **5**, 3655.
- Cone, E. F. Status of the electric steel industry. *Iron Age* **103**, 60-62 (1919); *C. A.* **13**, 283.
- Steel castings from electric furnace. *Iron Age* **91**, 1279-1283; *C. A.* **7**, 3274.
- Cornell, Sidney. Open hearth versus the electric furnace in the manufacture of commercial steels. *Met. Chem. Eng.* **13**, 630-631 (Sept. 15, 1915).
- Coussergues, Ch. C. de. Phenomenon of decantation in the electric furnace. *Rev. métal* **7**, 1-5 (Jan., 1910).
- Steel making in the electric furnace. *Rev. métal* **6**, 589-678 (June, 1909).
- Crafts, W. N. Producing steel in electric furnace. *Iron Age* **93**, 1066-1068 (1914); *J. Clev. Eng. Soc.*, July, 1914.
- Crowley, J. A. Gronwall-Dixon electric furnace. *Mech. Eng.* **38**, 306-307 (1917); *C. A.* **11**, 1087.
- Dalton, A. C. Electric steel direct from ore mines. *Iron Age* **94**, 877-879 (1914); *C. A.* **9**, 176; *Iron Age* **96**, 1184-1185 (1915); *C. A.* **10**, 427.
- Darling, Chas. R. Electric furnaces. *Nature* **103**, 235-236 (1919); *C. A.* **13**, 1974.
- Dary, G. Electric furnaces for the manufacture of steel. *L'Electricien* **27**, 305 (1904); *Proc. Inst. Civil Eng.* **158**, 37; *J. Soc. Chem. Ind.* **24**, 33.
- DeFries, H. A., and Herlenius, J. Developments in the Rennerfelt furnace. *Iron Age* **103**, 190-191 (1919); *C. A.* **12**, 536.
- Delpiano, Guido. The production of steel in the (Bassanese) electric furnace. *L'ind. chim. min. met.* **4**, 145-151 (1917); *C. A.* **11**, 2639.
- Descroix, L. Rennerfelt electric furnace for the melting of steel. *Lumière elec.* **26**, 5-10; *C. A.* **8**, 3532.
- Desulfurization of steel in the electric furnace. *Engineer* **106**, 249-50 (Sept. 4, 1908).
- Development of electric steel plants. *Stahl u. Eisen* **30**, 491-8 (Mar. 23, 1910); *Iron Age* **85**, 868-870 (Apr. 14, 1910).



- Dieffenbach, O. Principal electric furnaces for the preparation of steel and wrought iron. *Chem. App.* **2**, 149-152, 161-164, 173-176 (1915); *C. A.* **9**, 2736.
- Diller, H. E. Pointers on electric steel furnace practice. *Foundry* **47**, 239-242 (1919); *C. A.* **13**, 1423.
- Dixon, J. L. How slag influences electric steel. *Foundry* **47**, 483-484 (1919); *C. A.* **13**, 2312.
- Notes on electric steel melting. *Trans. Am. Electrochem. Soc.* **31**, 53-68 (1917); *Met. Chem. Eng.* **16**, 577-578; *C. A.* **11**, 2639.
- Doubs, F. Production of mild steel in the electric furnace. *Stahl u. Eisen* **31**, 589-592; *C. A.* **5**, 3197.
- DuBois, H. C., and Booth, C. H. Importance of electric furnaces in steel production. *Elec. Rev. West. Elec.* **73**, 173-174; *C. A.* **12**, 1856.
- Dufresne, A. O. Electric steel furnaces in the Province of Quebec. *J. four. elec.* **26**, 273-278 (1917); *C. A.* **12**, 250.
- Eilender, W. Electric steel production from the standpoint of the whole industry. *Stahl u. Eisen* **33**, 585-591; *C. A.* **7**, 2352; *Iron Age*, June 5, 1913.
- Electric crucible furnace for refining steel. *Iron Trade Rev.* **52**, 413-15 (Feb. 13, 1913).
- Electric furnace operation at Buffalo. *Elec. World* **73**, 1378-1381 (1919); *C. A.* **13**, 1972.
- Electric furnaces in the steel industry and their relation to the central station business. *Chem. Met. Eng.* **20**, 73-76 (1919); *C. A.* **13**, 813.
- Electric furnace in steel making. *Elec. Times*, Dec. 26, 1918, p. 383; *C. A.* **13**, 1046.
- Electric furnace making big headway in the steel industry. *Elec. Rev. West. Elec.* **71**, 176-181 (1917); *C. A.* **11**, 2997.
- Electric furnace for small steel castings. *Met. Chem. Eng.* **10**, 54-55 (1912); *C. A.* **6**, 713.
- Electric furnace steels and alloy steels. *J. Ind. Eng. Chem.* **8**, 947-950 (1916); *Met. Chem. Eng.* **15**, 448 (1916); *Iron Age*
- Electric furnace for steel refining and iron reduction. *Elec.* **98**, 722-723; *Iron Trade Rev.* **59**, 700-701 (1916).
- trochem. Met. Ind.* **4**, 164-165 (1906).

- Electric furnaces for heat treatment of steel. *Electrician* **83**, 375-377 (1919); *C. A.* **14**, 152.
- Electric induction furnace for making steel. *Electrochem. Met. Ind.* **3**, 294-296 (1905).
- Electric process of steel manufacture. *Electrochem. Ind.* **1**, 141 (1902).
- Electric production of steel from the early experiments of Siemens to the thirty-ton furnace of today. *Sci. Am. S.* **109**, 88-89 (1913).
- Electric refining furnace for cast steel. *Foundry* **41**, 94-95 (1913).
- Electric smelting of magnetic iron ore. *Electrochem. Met. Ind.* **4**, 4-5 (1906).
- Electric smelting furnace for steel. *Elec. Rev.* **63**, 342; *C. A.* **2**, 2903.
- Electric steel. *Elec. Rev.* **65**, 598; *C. A.* **4**, 147.
- Electric steel. *Electrochem. Met. Ind.* **4**, 472-474 (1906).
- Electric steel as a test of a great corporation. *Met. Chem. Eng.* **10**, 372-373 (1912); *C. A.* **6**, 2360.
- Electric steel castings made in Chicago shop. *Foundry* **47**, 352-355 (1919); *C. A.* **13**, 1792.
- Electric steel direct from titaniferous iron ores. *Iron Age* **96**, 1416 (1915); *C. A.* **10**, 150.
- Electric steel for roller bearings. *Iron Age* **100**, 303-305 (1917); *C. A.* **11**, 2997.
- Electric steel furnace in foundry practice. *Mach.* **19**, 611 (1913).
- Electric steel furnaces. *Elektrochem. Z.* **17**, 44-73 (1910); *C. A.* **4**, 2412.
- Electric steel furnaces at Gysinge. *Electrochem. Ind.* **1**, 376-377 (1903).
- Electric steel furnaces in California. *Metal Trades* **10**, 245-247 (1919).
- Electric steel furnaces in Great Britain. *Iron Age* **100**, 519, 1251 (1917).
- Electric steel furnaces in Japan. *Electrician* **80**, 139; *C. A.* **12**, 22.
- Electric steel furnaces in Sheffield. *Elec. Rev.* **73**, 154-157 (July 25, 1913).

Electric steel furnaces in plants at Toronto. *Elec. Rev. West. Elec.* **73**, 177-178 (1918); *C. A.* **12**, 1856.

Electric steel growth in Canada. *Elec. Rev. West. Elec.* **72**, 547 (1918); *C. A.* **12**, 1020.

Electric steel in Germany. *Elec. Rev. West. Elec.* **67**, 982 (1915); *C. A.* **10**, 150.

Electric steel in Germany and Austria. *Met. Chem. Eng.* **13**, 398 (1915); *C. A.* **9**, 1877.

Electric steel industry's present status. *Iron Age* **92**, 81.

Electric steel making in Spain with the utilization of slag. *Met. Chem. Eng.* **8**, 562 (1910); *C. A.* **5**, 250.

Electricity in steel making. *Elec. Rev. West. Elec.* **62**, 281.

Englehardt, V. Alleged inequality of the charge in the electric induction steel furnaces. *Stahl u. Eisen* **30**, 663-666 (Apr. 20, 1910).

Electric induction furnace for making steel. *Electrochem. Met. Ind.* **3**, 294 (1905).

Electric steel. *Z. Ver. deut. Ing.* **54**, 1961; *C. A.* **5**, 429.

Induction furnace and its use in the steel industry. *Electrochem. Met. Ind.* **6**, 143 (1908).

Kjellin method for electric production of steel. *Stahl u. Eisen* **25**, 148-52, 205-12, 272-78 (1905); *Iron Age* **76**, 1010-1014 (1905).

Production of steel in the electric furnace. *Z. d. Oest. Ing. u. Arch. Ver.*, Nov. 19, 1909.

The refining of steel in the electric furnace. *Oesterr. Z. Berg. Hüttenw.* **53**, 399-402, 419-421, 431-435, 444-448, 461-463, 470-473 (1905).

Escard, J. Electric steel. *Rev. gén. sci.* **29**, 366-373, 401-413 (1918); *C. A.* **13**, 930.

Estep, H. C. Buffalo electric steel foundry. *Iron Trade Rev.* **56**, 215-220; *Foundry* **43**, 1-5 (1915); *C. A.* **9**, 1150.

Ethells, H. Application of electric furnace methods to industrial processes. *Trans. Faraday Soc.* **14**, 71-78 (1919); *C. A.* **13**, 1423.

Electric steel at Sheffield. *Iron Age* **97**, 1379; *C. A.* **10**, 2071.

Modern steel making by electricity. *J. Elec.* **43**, 310-312 (1919).

- Evans, J. W. Some laboratory experiments in making steel directly from iron ores with the electric furnace. *J. Can. Min. Inst.* **9**, 128-142 (1906).
- Experiences in electric steel foundry. *Elec. World* **74**, 630-634 (1919); *C. A.* **13**, 2810.
- Farr, Arthur V. Electric steel and the forging industry. *Iron Age* **102**, 74-76; *Mach.* **25**, 40-42; *Am. Mach.* **49**, 753-755; *Automotive Ind.* **39**, 97-98 (1918); *C. A.* **12**, 2165.
- FitzGerald, F. A. J. Application of the Lash process to the electric furnace. *Trans. Am. Electrochem. Soc.* **15**, 149-158 (1909); *Electrochem. Met. Ind.* **7**, 268 (1909); *C. A.* **3**, 1246, 2535.
- Lash steel process and the electric furnace. *Trans. Am. Electrochem. Soc.* **14**, 239-250 (1908); *Electrochem. Met. Ind* **6**, 493-495 (1908); *C. A.* **3**, 1246.
- Flinterman, R. F. Electric steel castings. *Trans. Am. Electrochem. Soc.* **33**, 263-272 (1918); *Met. Chem. Eng.* **18**, 511-512, 610 (1918); *Iron Age* **101**, 1398; *C. A.* **12**, 1360.
- The electric furnace in the steel casting plant. *Met. Chem. Eng.* **16**, 574-577 (1917); *Trans. Am. Electrochem. Soc.* **31**, 69-80 (1917); *Foundry* **45**, 232-233; *C. A.* **11**, 2069.
- Electric process for small steel castings. *Iron Age* **99**, 1144-1146 (1917); *C. A.* **11**, 2069.
- French plant for making steel in the electric furnace. *Electrochem. Ind.* **1**, 162-165 (1903).
- Fresch, O., Rennerfelt, I. and von Eckermann, H. Experiments with the Rennerfelt furnace. *J. four elec.* **27**, 101 (1918); *C. A.* **12**, 2495.
- Frick, O. Electric refining of steel in an induction furnace of special type. *Engineering* **96**, 505-509, 539-543; *Electrician* **71**, 884; *Eng. Mag.* **46**, 439; *C. A.* **8**, 465.
- Frick furnace for electric refining of steel. *Iron Age* **92**, 1113-1114 (1913).
- Frick electric steel induction furnace. *Iron Age* **92**, 670-671, 744-747 (1913); *Sci. Am. S.* **76**, 357-359 (1913).
- Geilenkirchen, J. Chemical and physical reactions in the production of high quality electric steel. *Z. angew. Chem.* **24**, 1948-1956; *C. A.* **6**, 832.



- Germany's electric steel output much increased. *Iron Age* **96**, 1447 (1915); *C. A.* **10**, 150.
- Gifford, W. S. Electric arc furnaces in steel production. *Electrician* **70**, 444-447; *C. A.* **7**, 572.
- Electric furnace for steel castings. *Foundry* **36**, 31; *C. A.* **4**, 3041.
- Gin, G. Automatically circulating furnace of the Gin type for the electrical production of steel. *Trans. Faraday Soc.* **5**, 137 (1909); *Iron Coal Trades Rev.*, June 18, 1909.
- Calculations of a Gin self-circulating induction steel furnace. *Trans. Am. Electrochem. Soc.* **15**, 215-223; *C. A.* **3**, 2537.
- The electrical manufacture of steel. *Electrochemist and Metallurgist* **3**, 572-581 (Mar., 1904).
- Electrical steel furnace. *Eng. Min. J.* **80**, 875-6 (Nov. 11, 1905).
- New Gin process for the electrical manufacture of steel. *Trans. Am. Electrochem. Soc.* **8**, 105 (1905); *Eng. Min. J.*, Nov. 11, 1905.
- Recent developments in the Gin electric furnace. *Trans. Faraday Soc.* **2**, 44 (1906).
- Self circulating Gin furnace for the electric manufacture of steel. *Trans. Am. Electrochem. Soc.* **15**, 204-214 (1909); *C. A.* **3**, 2536.
- Self-circulating induction steel furnace. *Elektrochem. Z.* **16**, 201; *Trans. Faraday Soc.* **5**, 137; *C. A.* **3**, 2536-2537; **4**, 21.
- Girod, P. The electric steel furnace in foundry practice. *Met. Chem. Eng.* **10**, 663-665 (1912); *C. A.* **7**, 306.
- Girod electric steel furnace. *Electrochem. Met. Ind.* **7**, 259-260 (1909); *Trans. Am. Electrochem. Soc.* **15**, 127-138 (1909); *C. A.* **4**, 20.
- Girod electric steel furnace. *Electrochem. Met. Ind.* **6**, 428 (1908); *C. A.* **3**, 1721.
- Girod electric steel furnace. *Engineering* **104**, 519 (1917); *C. A.* **12**, 564.
- Gosron, R. C. Producing electric steel castings. *Iron Trade Rev.* **65**, 1706-1710 (1919).

- Gradenwitz, A. An improved electric steel furnace (Nathusius). *L'Electricien* **41**, 33-37 (Jan. 21, 1911); *Sci. Am. S.* **71**, 353-4 (June 10, 1911).
- Dommeldange electric steel plant. *Eng. Min. J.* **91**, 915-916; *C. A.* **5**, 2218.
- Gray, J. H. Steel making in electric furnaces. *Iron Age* **96**, 1238-1239 (1915); *Met. Chem. Eng.* **13**, 656-657 (1915); *C. A.* **10**, 149.
- Great electric steel works at Ugine. *J. four elec.* **27**, 193-194; *C. A.* **13**, 283.
- Great increase in electric steel production in Canada. *Elec. Rev. West. Elec.* **71**, 191 (1917); *C. A.* **11**, 2561.
- Greaves-Etchells electric furnace. *Iron Coal Trades Rev.*, Feb. 2, 1917.
- Greene, A. E. Electric heating and the removal of phosphorus from iron. *Trans. Am. Electrochem. Soc.* **22**, 123 (1912).
- Electric steel processes as competitors of the Bessemer and open hearth. *Trans. Am. Electrochem. Soc.* **19**, 233 (1911); *C. A.* **5**, 3377; *Iron Trade Rev.* **48**, 722-727 (1911).
- and Amberg, R. Function of the slag in steel refining. *Met. Chem. Eng.* **10**, 656 (1912); *C. A.* **7**, 1672.
- Greene electric furnace as used in Seattle steel foundries. *Elec. Rev.* **73**, 950; *Iron Age* **103**, 1005-1007; *Iron Trade Rev.* **64**, 1017; *J. Elec.* **43**, 14 (1919).
- Grondal-Kjellin and Röchling-Rodenhauser electric steel furnaces. *Engineering* **87**, 118-120 (1909); *C. A.* **3**, 1721.
- Grönwall, A. Why is electric steel sometimes unhomogeneous? *Met. Chem. Eng.* **8**, 34 (1910); *C. A.* **4**, 865.
- Grönwall steel furnace. *Elec. Rev. West. Elec.* **59**, 1139; *C. A.* **6**, 325.
- Guggenheim, S. Electric furnaces in the steel industry. *Schweiz Bau.*, Sept. 9, 1911.
- Manufacture of steel in the electric furnace. *Electrician* **73**, 764; *C. A.* **8**, 3758.
- Hadfield, Robert. Electric furnace in steel work. *Electrician* **80**, 903 (1918); *C. A.* **12**, 1361.

- Hammond. Making electric steel for roller bearings. *Mach.* **25**, 318-326 (1918).
- Hansen, C. A. Electric steel castings. *Trans. Am. Electrochem. Soc.* **25**, 133-138 (1914); *Met. Chem. Eng.* **12**, 335-336 (1914); *Iron Age* **93**, 1006-1007; *Iron Trade Rev.* **54**, 709; *C. A.* **8**, 2112.
- Harboard, F. W. The electric furnace in steel making. *Iron Age*, Aug. 24, 1905.  
Electric refining of steel. *Iron Age* **84**, 542-544; *C. A.* **4**, 1428.
- Harden, J. Electric furnace with special reference to the manufacture of high class steel. *Electrician* **67**, 287 (1911).  
Electric steel furnaces and ferrosilicon. *Engineering* **86**, 45; *C. A.* **4**, 416.  
The induction furnace for crucible steel making. *Iron Coal Trades Rev.*, Oct. 3, 1913.  
Induction furnaces and their relation to the steel industry. *Electrician* **70**, 436-442; *C. A.* **7**, 729.  
Induction furnace notes. *Met. Chem. Eng.* **11**, 559-562 (Oct., 1913).  
New electric furnace for steel melting and refining. *Met. Chem. Eng.* **9**, 38-39.
- Hess, H. L. Electric furnaces as applied to steel making. *Mech. Eng.* **41**, 245-8 (1919); *C. A.* **14**, 16.
- Hiorth, Albert. Induction furnace and its use in the manufacture of steel. *Am. Found. Assn. Trans.* **22**, 157-168 (1914).
- Hirsch, A. Electric furnaces for heating steel. *Sci. Am. S.* **77**, 338-339, 354-5 (1914).
- Holden, J. A. Economic production of electric steel. *Iron Age* **104**, 440-441 (1919); *C. A.* **13**, 2809.  
Electrically melted steel castings. *Foundry Trade J.* **21**, 584-585 (1919).  
Electric carbon tool steel—details of British production in a 3-ton Heroult furnace. *Iron Age* **101**, 1222-1223 (1918).
- Howe, H. M. Treatment of steel in electric furnaces. *Eng. Min. J.* **88**, 400-406 (1909); *C. A.* **4**, 993.
- Humbert E., and Hethey, A. Production of steel direct from ore. *Electrician* **73**, 259-260; *C. A.* **8**, 2848.

- Humbert, E. Electric furnace in the steel foundry. *Iron Age* **92**, 1414-1415 (1913).
- Ibbotson, E. C. The Kjellin electric steel furnace. *Trans. Am. Inst. Min. Eng.* 1906, 967-970; *C. A.* **1**, 289; *Iron Steel Institute*, 1906, No. 3, 397-400.
- Jones, F. D. Electric steel. *Mach.* **24**, 1104-1110 (1918).
- Kapp, G. Electric steel furnaces. *Electrician* **64**, 221; *C. A.* **4**, 279.
- Kearns, J. E. Electric annealing furnaces. *Electrochem. Met. Ind.* **4**, 95 (1906).
- Keeney, R. M. Pig steel from ore in the electric furnace. *Bull. Am. Inst. Min. Eng.* **86**, 349-367 (1914); **90**, 1289-1296 (1914); *Iron Age* **93**, 810-812 (1914); *C. A.* **8**, 1704.
- Kershaw, J. B. C. Electric furnace method of steel production. *Iron Trade Rev.* **51**, 865, 959, 1007, 1067, 1105, 1169; **52**, 197-203, 361-363 (1913).
- Induction furnace for steel refining. *Engineer*, London, **114**, 643-644 (Dec. 20, 1912).
- Methods of refining steel in the electric furnace. *Cassier's Mag.* **36**, 237-249 (July, 1909).
- Present position of electric steel refining. *Iron Trade Rev.* **46**, 76-79 (Jan. 6, 1910).
- Kjellin, F. A. The Kjellin and Röchling-Rodenhauser electric furnaces. *Trans. Am. Electrochem. Soc.* **15**, 173 (1909).
- Electric steel-smelting at Gysinge. *Glückauf*, Jan. 24, 1903.
- The electric steel furnace at Gysinge, Sweden. *Trans. Am. Inst. Min. Eng.* **34**, 742-747 (1904).
- Lake, E. F. Electric furnace heat treatment of steel. *Mach.*, Oct., 1913.
- Limitations of the electric furnace in the manufacture of steel castings. *Met. Chem. Eng.* **13**, 108-110 (1915).
- Steels made in the electric furnace. *Cassier's Mag.* **42**, 99-112; *C. A.* **6**, 3361.
- Lambot, J. Cast steel from electric furnaces. *Lumière elec.* **24**, 182; *C. A.* **8**, 298.
- Law, E. F. Electric furnace in the manufacture of steel. *Electrician* **70**, 433.



- Lellis, A. de, and Rines, C. New resistance type electric steel furnace (The Lellis furnace). *J. four elec.* **26**, 325-326 (1917); *C. A.* **12**, 332.
- Lindberg steel works. Electric furnace operations. *Electrician* **70**, 168; *C. A.* **7**, 307.
- Lindemuth, L. B. Metallurgy of electric furnace steel processes. *J. Eng. Club, Phil.*, **35**, 544-549 (1918); *Raw Materials* **1**, 109 (1919); *C. A.* **13**, 1282.
- Lipin, W. Nathusius electric steel furnace. *Met. Chem. Eng.* **10**, 227-232 (1912); *C. A.* **6**, 1401.
- Louden, T. R. Canadian electric steel furnace. *Can. Eng.*, Oct. 23, 1913.
- Ludlum electric steel furnace. *Electrician* **80**, 215 (1917); *C. A.* **12**, 451.
- Lyon, D. A. Noble Electric Steel Co's plant. *Trans. Am. Electrochem. Soc.* **15**, 39-52 (1909); *Electrochem. Met. Ind.* **7**, 252 (1909); *C. A.* **3**, 2534.
- MacGuffie, D. D. Electric furnace for steel castings. *Iron Age* **101**, 1282-1283; *C. A.* **12**, 1729.
- McKnight, Wm. Faults of the small electric arc furnace for melting and refining steel. *Met. Chem. Eng.* **14**, 478-479 (1916); *Trans. Am. Electrochem. Soc.* **29**, 493-496 (1916); *Iron Age* **97**, 1008 (1916).
- McWilliam, A. Present position of electric steel melting. *Electrician* **68**, 16; *C. A.* **6**, 29.
- Making electric steel for roller bearings. *Mach. (London)* **14**, 131-137 (1919).
- Manufacture of high grade steel in the electric furnace. *Electrochem. Met. Ind.* **6**, 26-27 (1908); *C. A.* **2**, 1261.
- Mathews, J. A. Comments on the electric steel industry. *Trans. Am. Electrochem. Soc.* **31**, 43-52 (1917); *Iron Age* **99**, 1146-1148; *C. A.* **11**, 2070.
- Electric furnace in steel manufacture. *Iron Age* **97**, 1327-1330, 1330-1332 (1916); *Iron Trade Rev.* **58**, 1264-1267.
- Electric furnace steel. *Trans. Am. Electrochem. Soc.* **15**, 240-244; *Electrochem. Met. Ind.* **7**, 262-263 (1909); *C. A.* **4**, 21.

- The future of electric steel. *Trans. Am. Electrochem. Soc.* **34**, 131-142 (1918); *Iron Age* **102**, 884 (1918); *C. A.* **13**, 1672.
- Mercer, R. G. British electric steel industry. *Iron Age* **103**, 1497; *J. Iron Steel Inst.* (1919); *C. A.* **13**, 1973.
- Metallurgy of the electric steel furnace. *Iron Age* **84**, 388; *C. A.* **5**, 1268.
- Moffet, F. J. Electric steel furnaces in England. *Elec. Rev.* **73**, 1000 (1918); *C. A.* **13**, 209; *Iron Age* **103**, 120 (1919); *C. A.* **13**, 399.
- English electric furnace development. *Blast Furnace and Steel Plant* **7**, 169-170 (1919); *C. A.* **13**, 1423.
- Montgomery, R. L. Possibilities of the electric steel furnace. *Elec. Rev. West. Elec.* **71**, 182 (1917); *C. A.* **11**, 2858.
- Moore, W. E. Electric furnaces for steel foundries. *Elec. J.* **16**, 360-366 (1919); *C. A.* **14**, 17.
- Electric furnaces in the steel foundry. *Iron Age* **102**, 1206-1207 (1918); *Blast Furnace*, **7**, 76-77 (1919); *C. A.* **13**, 91.
- Modern electric furnace practice in foundries. *Mech. Eng.* **41**, 874-876 (1919).
- Müller, A. Electric steel production in the Girod furnace. *Stahl u. Eisen* **31**, 1165-72 (July 20, 1911).
- Experiences in electric steel manufacture in a Girod furnace. *Stahl u. Eisen* **31**, 1165-1172, 1258-1264; *C. A.* **6**, 456.
- Manufacture of steel in the Girod electric furnace. *Met. Chem. Eng.* **9**, 581 (1911).
- Metallurgy of the acid electric steel process. *Stahl u. Eisen* **34**, 89-95; *Iron Age* **93**, 670-672; *Chem. Eng.* **19**, 154-156; *C. A.* **8**, 1915.
- Muntz, G. Limitations of the electric furnace in the manufacture of steel castings. *Met. Chem. Eng.* **13**, 108-110 (1915); *C. A.* **9**, 754.
- Nathusius, Hans. Improvements in electric furnaces and their application in the manufacture of steel. *Electrician* **69**, 306-308; *Min. Eng. World* **37**, 15-16; *Iron Age* **89**, 1402-1404; *Engineering* **93**, 22-27; *C. A.* **6**, 2207; *Chem. Ztg.* **36**, 1498-1499; *C. A.* **7**, 936; *Mech. Eng.*, May 10, 1912.
- Refining of steel in the Nathusius electric furnace. *J. Iron Steel Inst.* **85**, 41 (1912).

- Neumann, B. Nathusius electric steel furnace. *Stahl u. Eisen* **30**, 1410-1417 (Aug. 17, 1910).
- New Röchling-Rodenhauser induction furnace and further advances in electric steel manufacture. *Stahl u. Eisen* **28**, 1161-1167, 1202-1208; *Iron Age* **72**, 720; *C. A.* **2**, 3049.
- Present status of electric steel production. *Stahl u. Eisen* **30**, 1064-76 (June 22, 1910); *Iron Coal Trades Rev.*, Aug. 26, 1910.
- Recent results in electric production of cast steel, at the Trollhättan experimental plant. *Stahl u. Eisen* **32**, 1409-1416 (Aug. 22, 1912).
- New electric steel furnace. *Elec. Rev. (Lond.)* **77**, 451-454 (Oct. 8, 1913).
- New electric steel furnace. *Met. Chem. Eng.* **18**, 211-212 (1918); *C. A.* **12**, 1266.
- New electric steel plant and rolling mill. *Iron Age* **99**, 1003-1007 (1917); *C. A.* **11**, 2069.
- New sidelights on electric steel making. *Iron Age* **99**, 1132-1133 (1917); *C. A.* **11**, 2561.
- New type of electric furnace. *Elec. Rev. West. Elec.* **73**, 950 (1918); *C. A.* **13**, 91.
- Operating records of electric steel furnaces. *Elec. World* **74**, 125-127 (1919); *C. A.* **13**, 1973.
- Osborne, C. G. Electric furnaces in steel making. *Elec. World* **58**, 1243; *C. A.* **6**, 191.
- Few experiments with the 15-ton Heroult electric furnace at South Chicago. *Trans. Am. Electrochem. Soc.* **19**, 205 (1911); *Iron Age*, Jan. 5, 1911.
- Osann, B. Cast steel from the electric furnace. *Stahl u. Eisen* **28**, 654-662 (1908); *C. A.* **2**, 2364.
- Otto, C. Steel from ore. *Feuerungstechnik.* **3**, 129-131; *C. A.* **9**, 1719.
- Performance and equipment of a 2-ton electric furnace. *Elec. Rev. West. Elec.* **73**, 747-748 (1918); *Elec. Eng.* **52**, 12-13 (1918); *C. A.* **13**, 8.
- Perkins, Frank C. Kjellin electric furnace at Gysinge, Sweden, for the manufacture of steel. *Electrochem. Ind.* **1**, 576-578 (1903).

- Gin electric steel furnace. *Min. World* **25**, 494 (Oct. 20, 1906).
- New electric arc process for producing and refining steel. *Can. Min. J.* **31**, 687-690 (Nov. 15, 1910).
- New electric process for production and refining steel with composite arc electrodes. *Can. Min. J.* **31**, 82-85 (Feb. 1, 1910).
- The new Swedish furnace plant for the manufacture of steel. *Elec.*, N. Y., March 16, 1904.
- Refining steel from Bessemer converters by a composite electrode arc process. *Chem. Eng.* **14**, 406; *C. A.* **6**, 29.
- Perkins' process of refining steel. *Iron Age* **84**, 1558-1559 (1909); *C. A.* **4**, 3041.
- Pinot, Robert. Production of electric furnace steel. *Elec. Rev. West. Elec.* **61**, 676; *C. A.* **6**, 3361.
- Production of electric steel. *Elec. Rev. West. Elec.* **59**, 796; *C. A.* **5**, 3761.
- Progress in electric steel. *Iron Age* **103**, 571-572 (1919); *C. A.* **13**, 684.
- Queneau, A. L. New electric steel furnaces. *Trans. Am. Electrochem. Soc.* **17**, 131 (1910); *C. A.* **4**, 2768.
- Quinn, T. S. Electric furnace practice in making steel castings. *Iron Age* **98**, 614 (1916); *C. A.* **10**, 2841.
- Recent data on electric steel castings. *Iron Age* **93**, 1006-1010 (1914).
- Removal of sulfur in electric steel furnace. *Electrochem. Met. Ind.* **6**, 405 (1908).
- Rennerfelt, I. The electric arc furnace and the development of the steel casting industry. *Met. Chem. Eng.* **12**, 581-583 (1914); *C. A.* **8**, 3646.
- and von Eckermann, H. Results with a Rennerfelt steel furnace in Sweden. *Iron Age* **101**, 563; *C. A.* **12**, 1268.
- Rennerfelt arc furnace for producing electric steel. *Elec. Rev. West. Elec.* **63**, 290.
- Rennerfelt electric steel furnace. *Iron Age* **93**, 200-201 (1914).



- Richards, J. W. Electrometallurgy of iron and steel. *Electrochem. Met. Ind.* **5**, 165 (1907).
- Hiorth electric steel furnace. *Trans. Am. Electrochem. Soc.* **18**, 191-204 (1910); *Met. Chem. Eng.* **8**, 630 (1911); *C. A.* **5**, 1710.
- Largest electric steel works. *Electrochem. Met. Ind.* **7**, 9 (1909); *C. A.* **3**, 1494.
- The passing of crucible steel. *Met. Chem. Eng.* **8**, 563-568 (1916); *C. A.* **5**, 430.
- Pig steel made directly from ore in the electric furnace. *Met. Chem. Eng.* **10**, 397 (1912).
- Robertson, T. D. Electric steel making furnaces. *Engineering* **99**, 176-178 (1915); *Electrician* **74**, 630-632 (1915); *Inst. E. E. J.* **53**, 533-539, 539-544 (1915); *Elec. Rev.* *West. Elec.* **66**, 308-309 (1915); *C. A.* **9**, 1007.
- Grönwall steel refining furnace. *Met. Chem. Eng.* **9**, 573 (1911); *C. A.* **6**, 191.
- Robinson, T. W. Electric steel furnace experiments at South Chicago. *Met. Chem. Eng.* **10**, 373 (1912); *C. A.* **6**, 2360.
- Triplex process of making electric steel. *Iron Age* **101**, 1471-1477; *Chem. Met. Eng.* **19**, 15-20 (1918); *Iron Trade Rev.* **62**, 1432-1438; *Iron Age* **101**, 1476-1477; *C. A.* **13**, 536.
- Rodenhauser, W. Construction and application of the electric furnace in the steel industry. *Elektrochem. Z.* **33**, 993.
- Electric furnace and electrical process for steel making. *Z. Elektrochem.* **15**, 901; *J. Iron Steel Inst.* **79**, 261 (1909); *C. A.* **3**, 1961; **4**, 1131.
- Electric furnace and electric steel production with special reference to the Röchling-Rodenhauser furnace. *Oesterr. Z. Berg Hüttenw.* **58**, 727-728; *C. A.* **5**, 1710.
- Electric furnace for steel making. *Engineering* **87**, 690; *Electrician* **63**, 206; *C. A.* **3**, 1961.
- Electric steel and its production. *Z. angew. Chem.* **24**, 2289-2302; *C. A.* **6**, 573.
- Rowlands, T. Induction furnace progress. *Trans. Am. Electrochem. Soc.* **17**, 103-130 (1910).

- Schmelz, E. M. New electric steel casting plant. *Met. Chem. Eng.* **11**, 709-710 (1913); *Elec. Rev. West. Elec.* **63**, 1081-1082; *C. A.* **8**, 465.
- Preparation of electric steel in the Stassano furnace. *Oesterr. Z. Berg. Hüttenw.* **59**, 295-301, 313-317, 325-328, 341-342 (1911); *C. A.* **6**, 191.
- Schroeder, F. *Elektrochem. Z.* **17**, 44-6, 73-76, 104-5 (1910).
- Scott, E. K. Electric steel furnaces. *Elec. Rev. (London)* **81**, 45-47 (1917); *C. A.* **11**, 2858; *Iron Coal Trades Rev.*, July 6, 1917.
- Scott, Wirt S. Development of an electric furnace for annealing, treatment and forging of steel. *Chem. Met. Eng.* **19**, 86-89 (1918); *C. A.* **13**, 284.
- Electric furnaces for forging steel. *Met. Chem. Eng.* **19**, 86-89 (1918); *Elec. Rev.* **72**, 941-944; *Iron Age* **101**, 1676-1677; *Iron Trade Rev.* **63**, 440-442 (1918); *C. A.* **13**, 2165.
- Seager, J. A. Production of electric furnace steel. *Iron Trade Rev.* **44**, 1027 (1909); *C. A.* **4**, 865.
- Sigm. Electric steel. *Elektrochem. Z.* **35**, 553-558.
- Simpson, Louis. Cost of electric steel process. *Electrochem. Ind.* **1**, 363 (1902).
- Snyder, F. T. Cost of electric furnace steel. *Iron Age* **96**, 926-928; *Iron Trade Rev.* **57**, 1091-1092 (1915).
- Electric steel. *Iron Trade Rev.* **55**, 1077-1082, 1127-1130 (1914).
- Electric steel costs. *Trans. Am. Electrochem. Soc.* **28**, 221-238 (1916); *C. A.* **9**, 3029.
- Production of electric steel castings. *Foundry* **41**, 468 (1913); *C. A.* **9**, 755.
- South Chicago electric furnace plant of the U. S. Steel Corp'n. *Met. Chem. Eng.* **8**, 179 (1910).
- Stanley, G. H. and Buchanan, W. Design and operation of a small Kjellin furnace (South Africa). *Met. Chem. Eng.* **18**, 349-362, 416-420 (1918); *C. A.* **13**, 283, 1046.
- Stansbie, J. H. Electric refining furnaces for cast steel. *Foundry* **41**, 94.

- Stansfield, A. Steel direct from ore in the electric furnace. *Can. Eng.* **21**, 574-5 (Nov. 16, 1911).
- Tool steel direct from the ore in an electric furnace. *J. Can. Min. Inst.* **13**, 151-162; *Can. Min. J.* **31**, 372-375 (June 15, 1910) *J. Soc. Chem. Ind.* **30**, 286; *C. A.* **5**, 3655 (1910).
- Stassano, E. Application of the electric furnace to siderurgy. *Trans. Am. Electrochem. Soc.* **15**, 63 (1909).
- Rotating electric steel furnace in the artillery construction works, Turin. *Trans. Faraday Soc.* **2**, 150-151 (1907); *C. A.* **1**, 821.
- Status of the electric steel industry. *Iron Age* **99**, 105-107 (1917); *C. A.* **11**, 422; *Iron Age* **101**, 84-85, 113 (1918); *C. A.* **12**, 451.
- Stedman, H. G. A. Electric furnace process as applied to the metallurgy of steel. *Can. Min. J.* **33**, 337-43 (May 15, 1912).
- Steel electrically produced from ore. *Elec. Rev. West. Elec.* **67**, 904 (1915); *C. A.* **10**, 16.
- Steel making in the electric induction furnace. *Eng. News.* **57**, 285 (1907); *C. A.* **1**, 1259.
- Steel making in the electric furnace. *Commonwealth Engineer (Australia)* Sept. 1, 1917; *Elec. World* **70**, 1014; *C. A.* **12**, 251.
- Steel production in the electric furnace. *Electrochem. Ind.* **1**, 247-249 (1903).
- Steel refining in the electric furnace. *Electrochem. Met. Ind.* **7**, 2; *C. A.* **3**, 1721.
- Stobie, V. Electric furnaces in steel making. *J. West of Scotland Iron and Steel Inst.* **26**, 90-94, 94-103 (1919).
- Large electric steel melting furnaces. *Iron Coal Trades Rev.* **98**, 618-621 (1919); *Foundry Trade J.* **21**, 304-311 (1919); *Engineer* **107**, 749-751; *C. A.* **13**, 2809; *Electrician* **83**, 526-528 (1919).
- Manufacture of electric steel in the Stobie furnace. *Mech. Eng.* **35**, 502-504 (1916); *Engineer*, **119**, 616-617 (1915); *Iron Age* **95**, 1171 (1915); *C. A.* **10**, 2842.
- Styri, H. The electric furnace in the development of the Norwegian iron industry. *Trans. Am. Electrochem. Soc.* **32**, 129-140 (1917); *C. A.* **11**, 3177.



- Sutherland, W. F. New Moffat electric steel furnace. *Can. Machy.* **22**, 69-70 (1919).
- Swerkrop, E. A. Manufacture of electric tool steel. *Am. Mach.* **48**, 351-358 (1918).
- Swiss electric furnace steel plant. *Electrochem. Met. Ind.* **6**, 452 (1908).
- Sykes, W. Status of the electric steel furnace. *Iron Age* **92**, 856-857 (1913).
- Thallner, O. Manufacture of high grade steel in the electric furnace. *Electrochem. Met. Ind.* **6**, 26-27 (1908).
- Thieme, H. Electric steel plant of LaGallais, Metz and Co. in Dommelden. *Elektrotech. Z.* **31**, 903-907, 934-940; *C. A.* **5**, 429.
- Thwaite, B. H. Electro crucible fusion of steel and iron. *Iron Coal Trades Rev.*, Jan. 31, 1896.
- Tirbutt, A. M. Electric steel industry in Canada. *Can. Elec. News* **26**, 29-32 (1917); *C. A.* **12**, 789.
- Tupper, C. A. Refining of steel by electric furnace process. *Elec. Rev.* **71**, 963-966 (1917).
- Turnbull, R. Heroult electric steel furnace. *Iron Age* **83**, 1498-1499 (1909); *Trans. Am. Electrochem. Soc.* **15**, 39; *Electrochem. Met. Ind.* **7**, 260 (1909); *C. A.* **4**, 865.
- Twenty-four ton induction furnace for steel manufacture. *Electrochem. Met. Ind.* **5**, 172-173 (1907); *C. A.* **1**, 1949.
- Vom Baur, C. H. Electric furnace for making steel castings. *Foundry* **41**, 55-58 (1913); *C. A.* **7**, 1443; *Iron Trade Rev.* Jan. 9, 1913.
- Electric induction furnace for cast steel. *Foundry*, Sept., 1912.
- Electric induction and resistance furnace for steel. *Trans. Am. Electrochem. Soc.* **22**, 117-122; 8th Inter. Cong. Appl. Chem. **27**, 168-170; *C. A.* **7**, 2159.
- Röchling-Rodenhauser electric furnace for making steel castings. *Iron Trade Rev.* **52**, 153-156 (1913).
- Steel castings from electric furnaces. *Chem. Eng.* **14**, 332; *C. A.* **5**, 3655.
- Vom Baur electric steel furnace. *Iron Age* **103**, 1071-1073; *Chem. Met. Eng.* **20**, 488-489 (1919); *C. A.* **13**, 1422.



- Walker, Wm. R. Electric furnace as a possible means of producing an improved quality of steel. *Met. Chem. Eng.* **10**, 371 (1912); *C. A.* **6**, 2360.
- Electric furnace and high grade steel. *Iron Age* **89**, 1272 (May 23, 1912); *Iron Trade Rev.* **50**, 1172-75 (1912).
- Walsh, G. E. The electric refining of steel. *Elec. Rev. West. Elec.* **59**, 230; *C. A.* **6**, 29.
- Electric manufacture of steel. *Am. Electrician*, March, 1903.
- Webb electric steel furnace. *Iron Age* **102**, 257-260 (1918); *C. A.* **12**, 2068.
- Wedding, H. Modification of the induction furnace for steel refining. *Electrochem. Met. Ind.* **6**, 10 (1908).
- Weiller, P. The present state of the electric steel question. *Chem. Ztg.* **35**, 27-28; *C. A.* **5**, 1367.
- Wild-Barfield electric muffle. *Engineering* **106**, 143 (1918); *C. A.* **13**, 209.
- Wile, R. S. Electric steel furnace of new design. *Iron Age* **96**, 966-968 (1915); *C. A.* **10**, 149.
- Wills, W. H. and Schuyler, A. H. Heat losses from an electric steel furnace. *Trans. Am. Electrochem. Soc.* **28**, 207-220 (1915); *C. A.* **9**, 3029.
- Wolff, R. H. Commercial electric steel and gas power. *Electrochem. Met. Ind.* **6**, 225-226 (1908); *C. A.* **2**, 2209.
- Wright, C. E. Electric heat treatment of gun forgings. *Iron Age* **103**, 673-678 (1919); *C. A.* **13**, 1046.
- Wysor, R. J. Recovery of tungsten from steel scale. *Iron Age* **93**, 910; *C. A.* **8**, 2113.

## ALLOYS.

- Bardell, E. S. Manufacture of ferro-alloys in the electric furnace. *Mining J.* **123**, 708 (1918).
- Catani, R. Application of electricity in the metallurgy of Italy. *J. Iron Steel Inst.* **84**, 215 (1911); *Met. Chem. Eng.* **9**, 642 (1911).
- Chaplet, M. Les alliages ferrometalliques, *Rev. métal.* **6**, 739 (1909).

Easton, W. H. Electric furnace for melting alloys. *Elec. World* **72**, 295-297 (1918).

Electric alloy steels made on tonnage basis. *Iron Age* **98**, 571-574 (1916).

Electric furnace performance for alloys with high zinc content. *Elec. World* **74**, 814-815 (1909).

Ferro-alloys. *Electrochem. Met. Ind.* **4**, 247 (1906).

Ferro-alloys manufactured in the electric (Girod) furnace. Pamphlet, Soc. Electrometallurgists (1911?); *C. A.* **5**, 1232.

Gibson, C. B. Manufacture of ferro-alloys in the electric furnace. *Elec. J.* **16**, 366-372 (1919); *C. A.* **14**, 16.

Gin, G. Decarbonization of ferro-alloys. *Trans. Am. Electrochem. Soc.* **15**, 225-226 (1909).

Memoirs on the methods of treatment of simple and complex ores of molybdenum, tungsten, uranium and vanadium. *Trans. Am. Electrochem. Soc.* **12**, 411-476 (1907); **13**, 481-541 (1908); **16**, 393-473 (1909).

Girod, P. Manufacture of ferro-alloys in the electric furnace. *Mem. compt. rend. soc. ing. civ. de France*, 1906, 719-740; *C. A.* **1**, 978.

Electrometallurgy of ferro-alloys and steel. *Electrician*, **56**, 14 (Oct. 14, 1910).

Haughton, E. Ferro-alloys in the foundry. *Electrochem. Met. Ind.* **5**, 9 (1907).

Keeney, R. M. Electric smelting of chromium, molybdenum and vanadium ores. *Trans. Am. Electrochem. Soc.* **24**, 167-190 (1913); *Met. Chem. Eng.* **11**, 585 (1913).

Manufacture of ferro-alloys in the electric furnace. Bureau of Mines, Tech. Paper 77, iii; *C. A.* **9**, 754.

Manufacture of ferro-alloys in the electric furnace. *Bull. Am. Inst. Min. Eng.* **140**, 1321-1373 (1918); **143**, 1651-1654; *Iron Age* **102**, 624-625, 747, 786-787; *Eng. Min. J.* **106**, 405-409; *Chem. Met. Eng.* **19**, 281-282; *C. A.* **12**, 2164; **13**, 931.

Production of steel and ferro-alloys directly from ore in the electric furnace. *Iron Steel Inst. (Carnegie Scholarship Mem.)* **4**, 108 (1912).

and Lee, G. M. Direct production of steels and ferro-alloys from ores in the electric furnace. *West. Chem. Met.* **6**, 269, 323, 347 (1910).

- Keller, C. A. Electric furnace and the manufacture of ferro-alloys. *J. Iron Steel Inst.* **63**, 162 (1903).
- Lyon, D. A., Kenney, R. M., and Cullen, J. F. Electric smelting of ferro-alloys. *Iron Trade Rev.* **56**, 717-722, 765-767, 862-867, 972-975 (1915).
- Manufacture and use of ferro-alloys. *Engineer* **105**, 80, 105 (1908).
- Navarrete, J. M. Electrical production of ferro-alloys. *Energia Electrica* **21**, 137-140 (1919).
- Neumann, B. New process for producing low-carbon ferro-alloys. *Stahl u. Eisen* **28**, 356-360; *C. A.* **2**, 1687.
- New electric furnace for making ferro-alloys. *Elec. World* **71**, 566 (1918); *C. A.* **12**, 1267.
- Northrup, E. F. Electrolytic production of carbon free alloys. *Chem. Met. Eng.* **21**, 258-259 (1919); *C. A.* **13**, 3084.
- Rossi, A. J. Ferro alloys. *Min. Ind.* **12**, 693 (1903).
- Manufacture of ferro-alloys in general and of ferrotitanium in particular in the electric furnace. *Electrochem. Ind.* **1**, 523-526 (1903); *Iron Age*, Nov. 12, 1903.
- Scholl, Geo. P. Manufacture of ferro-alloys in the electric furnace. *Electrochem. Ind.* **2**, 349-351, 395-396, 449-452 (1904).
- Seede, J. O. Electric furnaces in the production of steel and ferro-alloys. *Gen. Elec. Rev.* **21**, 767-780 (1918).
- Stansfield, A. Tool steel direct from ore in an electric furnace. *Trans. Can. Min. Inst.* **13**, 151 (1910).
- Steinhart, D. J. Notes on metals and their ferro-alloys used in the manufacture of alloy steels. *Inst. Min. Met.* **15**, 228 (1905); *Mining J.* 1906, 128.
- Venator, W. Iron alloys and metals for the steel industry. *Stahl u. Eisen* **28**, 41 (1908); *Iron Coal Trades Rev.* **76**, 520 (1908).
- Widmer, G. France and the electrometallurgy of ferro-alloys. *J. four elec.* **27**, 65-74 (1918); *C. A.* **12**, 1268.
- Wile, R. S. Electric furnace smelting of ferro-alloys, *Trans. Am. Electrochem. Soc.* **28**, 239-246 (1915); *C. A.* **9**, 2623.
- Electric smelting of ferro-alloys. *Iron Age* **95**, 1068-1069 (1915); *C. A.* **9**, 1719.

- Wolff, R. H. Use of the electric furnace for making alloy steels. *Electrochem. Met. Ind.* **6**, 6 (1908); *C. A.* **2**, 987.
- Yensen, T. D. Preparation of pure alloys for magnetic purposes. *Trans. Am. Electrochem. Soc.* **32**, 269-286 (1917); *C. A.* **12**, 23.

### FERRO-SILICON.

- Anderson, R. J. Metallurgy of ferro-silicon. *Iron Trade Rev.* **60**, 1025-1029 (1917); *Eng. Min. J.* **103**, 1095-1098.
- Burton, R. C. High grade ferro-silicon and the silicides of iron. *Durham Phil. Soc.* **3**, 293-302; *C. A.* **7**, 2014.
- Conrad, W. Electric furnace for the manufacture of calcium carbide and ferro-silicon. *Electrochem. Met. Ind.* **6**, 397 (1908).
- Progress of large size electric furnace for ferro-silicon and calcium carbide. *Engineering* **86**, 46; *C. A.* **4**, 417.
- and Pick, W. Preparation of high percentage ferro-silicon in electric oven. *Rev. métal.* **9**, 362 (1912).
- Escard, M. Ferro-silicon. *La Lumière Electrique*, Mar. 6, 1919.
- Ferro-silicon made in the electric furnace. *Electrochem. Met. Ind.* **2**, 122-123 (1904).
- Ferro-silicon and aluminum in Norway. *J. four elec.* **26**, 211 (1917).
- Gin, G. Ferro-silicon. *L'Eclairage Electrique* **27** (May 4, 1900).
- Hanig, A. Notes on the production of ferro-silicon in the electric furnace. *Elektrochem. Z.* **20**, 41-43, 68-71; *C. A.* **7**, 3274.
- Hinrichsen, F. W. Ferro-silicon, properties of the electrically produced product. *Mitt. kgl. Materialprüfungsamt* **28**, 283-292; *C. A.* **5**, 1020.
- Louis, J. Manufacture of ferro-silicon in the electric furnace. *J. four elec.*, Oct. 1, 1910, 415.
- Pelavel. Ferro-silicon. *J. d'Electrolyse* **3**—(June 3, 1904).
- Pick, W., and Conrad W. Manufacture of ferro-silicon in the electric furnace. *Lumière elec.* **19**, 43-45; *C. A.* **6**, 3059.
- Vanzetti, B. F. Formation of iron silicides in the electric furnace. *Gaz. chim. ital.* **36**, I, 498-513 (1906); *J. Soc. Chem. Ind.* **25**, 993.



## FERROMANGANESE.

- Bardwell, E. S. Size vs. recoveries in ferromanganese furnaces. *Chem. Met. Eng.* **19**, 749 (1918); *C. A.* **13**, 399.
- Biltner, F. Premelting ferromanganese in an electric furnace. *Iron Age* **100**, 254 (1917).
- Buck, E. C. Bibliography on the manufacture of ferromanganese. *Met. Chem. Eng.* **17**, 638-642 (1917); *C. A.* **12**, 117.
- Electric smelting of ferromanganese ore in California. *Elec. Rev. West. Elec.* **73**, 940 (1918); *C. A.* **13**, 92.
- Harden, J. Electric furnace for melting ferromanganese. *Elec. Rev. (London)* **82**, 116 (1918); *C. A.* **12**, 1020.
- Jakobi, J. Ferromanganese in Hochofen. *Stahl u. Eisen* **29**, 1191 (1909).
- Korten, R. Melting of ferromanganese in the electric furnace. *Stahl u. Eisen* **32**, 425-432 (1912); *C. A.* **6**, 3059.
- Lonergan, J. Eliminating phosphorus and sulfur in electric ferromanganese furnaces. *Chem. Met. Eng.* **20**, 245 (1919); *C. A.* **13**, 813.
- Marcy, H. O. Ferromanganese smelting in electric furnace. *Eng. Min. J.* **102**, 627 (1916).
- Neumann, G. Preparation of ferromanganese in electric oven. *Stahl u. Eisen* **28**, 356 (1908).
- Schroeder, F. Remelting of ferromanganese in the electric furnace and the use of molten ferromanganese for deoxidation. *Met. Chem. Eng.* **9**, 640-641 (1911); *Stahl u. Eisen* **31**, 1457-1462 (Sept. 7, 1911).
- Stassano, E. Treatment of iron and steel in the electric furnace. *Electrochem. Met. Ind.* **6**, 315 (1908).

## FERROCHROMIUM.

- Calberla, R. Manufacture of ferrochromium in the electric furnace. *J. Soc. Chem. Ind.* **27**, 549 (1908); *C. A.* **2**, 2903.
- Ferrochrome produced electrically. *Elec. Rev. West. Elec.* **63**, 1038; *C. A.* **8**, 298.
- Greenwood, H. C., Slade, R. E., and Pring, J. M. Reduction of refractory oxides and production of ferro-alloys and formation of carbides. *J. Chem. Soc.* **93**, 1484 (1908); *Electrochem. Met. Ind.* **7**, 119 (1909).

Scholl, G. P. Manufacture of ferro-alloys in the electric furnace. *Electrochem. Ind.* **2**, 450 (1904).

### FERROTUNGSTEN.

Electric production of ferrotungsten. *Eng. Min. J.* **93**, 173 (1912).

Keeney, R. M. Electric furnace data for ferrotungsten. *Blast Furnace* **6**, 486-487 (1918).

Pratt, L. R. Manufacture of metallic tungsten and ferrotungsten. *Eng. Min. J.* **90**, 959; *C. A.* **5**, 60.

### FERROMOLYBDENUM.

Dittus, E. F., and Bowman, R. G. Direct production of molybdenum steel in the electric furnace. *J. Ind. Eng. Chem.* **3**, 717-723 (1911); *Trans. Am. Electrochem. Soc.* **20**, 355-374 (1911); *C. A.* **5**, 3761.

Evans, J. W. Ferromolybdenum manufacture in Canada. *Can. Chem. J.* **2**, 208-210 (1918); *C. A.* **12**, 2165.

Guichard, M. Production of molybdenum from molybdenite. *Compt. rend.* **122**, 1270.

Lenher, W. Preparation of molybdenum. *Metallurgie* **3**, 549 (1906).

### MISCELLANEOUS.

Ballagh, J. C. and Iwai, K. Investigation of ferroboron. *Min. Sci. Press* **99**, 185 (1909).

Electric smelting of nickel ore. *Met. Chem. Eng.* **8**, 277 (1910).

Ferrovandium. *Iron Trade Rev.* **5**, 275 (1912).

Gin, G. Manufacture of silico-vandium. *Trans. Am. Electrochem. Soc.* **15**, 229-230 (1909).

M. H. Electric reduction of titaniferous iron ores. *Rev. gen. sci.* **20**, 863; *C. A.* **4**, 994.

Mason, F. H. Nickel-copper steel direct from Sudbury ores. *Min. Sci. Press* **116**, 57-58 (1918); *C. A.* **12**, 790.

Ongaro, G. Desulfurizing in the electric furnace (a new sulfosilicate). *La metallurgia italiano* **9**, 468-471 (1917); *C. A.* **12**, 451.

Sjostedt, E. A. Electric smelting experiments for the manufacture of ferro-nickel from pyrrhotite. *Trans. Am. Electrochem. Soc.* **5**, 233-240 (1904); *Elec. Rev.* **44**, 720-722 (1904).

Slocum, C. V. Titanium in iron and steel. *Trans. Am. Electrochem. Soc.* **20**, 265-280 (1911).

Titanium vanadium tool steel direct from titaniferous iron ore. *Can. Min. J.* **32**, 591-593; *C. A.* **6**, 29.

## NON-FERROUS METALS

### General.

Baily, T. F. Electric furnace of the resistance type. *Chem. Met. Eng.* **21**, 11-13 (1919); *C. A.* **13**, 2159.

Electric furnace progress. *Metal Ind.* **17**, 316-319 (1919); *C. A.* **13**, 2159.

Collins, E. F. Electric furnace for melting non-ferrous metals. *Foundry* **47**, 284-288, 329-333 (1919); *Elec. World* **73**, 1110-1114, 1117; *Iron Trade Rev.* **64**, 1023-1024; *Iron Age* **103**, 1288; *Metal Ind.* **17**, 221-224; *C. A.* **13**, 1874.

Melting of some non-ferrous metals and their alloys in the electric furnace. *J. Cleveland Eng. Soc.* **11**, 293-314, 314-320 (1919); *Chem. Met. Eng.* **21**, 673-679 (1919). Cf. *Chem. Met. Eng.* **22**, 148-149 (1920).

Easton, W. H. Electric furnace for melting alloys. *Elec. World* **72**, 295-298 (1918); *C. A.* **12**, 2068.

Electric furnace development for non-ferrous metals. *Metal Ind.* **14**, 444-447 (1919).

Electric furnace for melting non-ferrous metals. The Baily furnace. *Metal Trades* **10**, 366-370 (1919).

Electric furnace for non-ferrous metals. *Iron Trade Rev.* **50**, 279-80 (Feb. 1, 1912).

Electric furnace for non-ferrous metallurgy. *Elec. World* **70**, 802-805 (Oct. 27, 1917).

Electric furnace in non-ferrous industry. *Iron Age* **100**, 1122-1123, 1172 (1917).

Hering, Carl. Ideals and limitations in the melting of non-ferrous metals. *Proc. Inst. Metals, London*, **17**, 243-250 (1917); *C. A.* **11**, 2070.

- Jones, J. L. Electric furnace problems. *Bull. Am. Inst. Min. Eng.* **148**, 690-691 (1919); *C. A.* **13**, 1424.
- Miller, Dwight D. Electric furnace as a medium for heating non-ferrous metals. *J. Am. Inst. Metals* **11**, 257-290 (1917); *Met. Chem. Eng.* **17**, 537-541; *Elec. World* **70**, 802-805; *C. A.* **12**, 1267.
- Electrical melting of non-ferrous metals. *Foundry* **46**, 110-114 (1918); *C. A.* **12**, 1268.
- Present progress and development of the electric furnace in non-ferrous metallurgy. *Met. Chem. Eng.* **17**, 537-541 (1917); *Iron Age* **100**, 1122-1123; *C. A.* **12**, 117.
- Peters, F. Developments in the electrometallurgy of the lighter metals. *Glückauf.* **45**, 1583-1591.
- Richards, J. W. Electric furnaces in non-ferrous metallurgy. *Met. Chem. Eng.* **8**, 233 (1910); *C. A.* **5**, 248.
- Stansfield, Alfred. Electric furnaces as applied to non-ferrous metallurgy. *Chem. Trade J.* **58**, 317-318, 339 (1916); *C. A.* **10**, 1813; *Cassier's Mag.*, June, 1916.
- Electric smelting of non-ferrous metals. *J. Franklin Institute*, **183**, 121-122 (1917).
- Weeks, C. A. Melting of non-ferrous metals in an electric furnace. *Met. Chem. Eng.* **9**, 363-365 (1911); *C. A.* **5**, 3199.

### Brass.

- Baily, T. F. Baily electric metal melting furnace. *Metal Ind.* **15**, 399-401 (1917).
- Electric furnace for brass melting. *Met. Chem. Eng.* **17**, 461 (1917); *Elec. World* **70**, 820 (1917).
- Resistance furnace for melting brass. *Trans. Am. Electrochem. Soc.* **32**, 155-164 (1917); *C. A.* **11**, 3177.
- Baily electric brass melting furnace. *Elec. Rev.* **74**, 438 (1919); *C. A.* **13**, 813.
- Blakeslee, R. N. Operating brass making induction furnaces. *Elec. World* **74**, 642-644 (1919); *C. A.* **13**, 2810.
- Booth, C. H. Booth electric rotating brass furnace. *Metal Ind.* **17**, 317-319 (1919).



- New electric rotating electric furnace. *Iron Age*, **103**, 1699-1703 (1919); *J. Elec.* **43**, 223-224 (1919); *C. A.* **14**, 18; *Metal Ind.* **17**, 317-319 (1919).
- Bragg, C. T. Modern brass foundry progress. *Trans. Am. Brass Founders' Assn.* **4**, 43 (1910).
- Clamer, G. H. Electric melting of copper and brass. *Trans. Am. Inst. Metals* **6**, 129-131 (1912).
- Hering electric furnace for brass melting. *Trans. Am. Inst. Metals* **7**, 350-355 (1913); *Metal Ind.* **12**, 63-64; *C. A.* **8**, 1915.
- Melting brass in the induction furnace. *J. Am. Inst. Metals* **11**, 381-395, 443-445 (1917); *Am. Mach.* **48**, 21-22 (1918); *C. A.* **13**, 399.
- and Hering, C. Developments in electric brass furnace melting. New type to utilize the pinch effect. *Foundry* **42**, 487-490 (1914); *Iron Age* **94**, 1492-1495 (1914); *Ind. Eng.* **15**, 56-57 (1915).
- and Hering, C. Electric furnace for brass melting. *Trans. Am. Inst. Metals* **6**, 95-109 (1912); *Brass World* **8**, 357 (1912); *Foundry* **40**, 483 (1912); *C. A.* **7**, 3922.
- and Hering, C. Electric brass melting. *Trans. Am. Inst. Metals* **8**, 270-288 (1914); *Iron Trade Rev.* **55**, 869-872 (1914); *Met. Chem. Eng.* **12**, 648-649 (1914); *C. A.* **8**, 3759.
- Clark, W. R. Electric brass furnaces displace other types. *Elec. World* **73**, 741-742 (1919); *C. A.* **13**, 1186.
- Dorsey, H. G. Tests on electric furnaces for brass foundries. *Trans. Am. Inst. Metals* **8**, 246-254 (1914); *Met. Chem. Eng.* **12**, 644-645 (1914); *C. A.* **8**, 3759.
- Use of electricity in melting brass. *Iron Trade Rev.* **57**, 319-320 (1915).
- Electric furnaces. *Elec. World* **63**, 1508; *Met. Chem. Eng.* **12**, 483; *C. A.* **8**, 2848.
- Electric furnace for brass melting. *Eng. Min. J.* **96**, 350 (1913).
- Electric furnace in the brass foundry, Lumen Bearing Plant, Buffalo. *Iron Age* **99**, 301-305 (1917).
- Electrically heated crucibles. *Engineering* **107**, 416; *C. A.* **13**, 1424.

- Gillett, H. W. Brass furnace practice in the United States. Bureau of Mines, Bull. **73** (1914).
- Symposium on electric furnaces. Utilization of electric brass furnaces. J. Ind. Eng. Chem. **11**, 664-668 (1919); Met. Chem. Eng. **21**, 6-10 (1919); Metal Ind. **17**, 316-322 (1919); C. A. **13**, 1974.
- and Lohr, J. M. Melting losses in electric brass furnaces. Met. Chem. Eng. **12**, 647-648 (1914); C. A. **8**, 3646.
- and Rhoads, A. E. Melting brass in a rocking electric furnace. Bureau of Mines, Bull. **171**, 126 pp. (1918); J. Ind. Eng. Chem. **10**, 459-468 (1918); Met. Chem. Eng. **18**, 583-590; Foundry **46**, 314-320; Am. Mach. **48**, 1013-1020; Metal Ind. **16**, 265-268; Elec. World **72**, 360.
- Hansen, C. A. Electric melting of copper and brass. Trans. Am. Inst. Metals **6**, 110-131 (1912); C. A. **7**, 937.
- Hering, C. The electric brass furnace. Foundry **41**, 111-112 (1913); C. A. **7**, 1673.
- Practical limitations of resistance furnaces, the pinch phenomenon. Trans. Am. Electrochem. Soc. **11**, 329 (1907).
- Manning, V. H. Electrical furnaces for the melting of brass. Elec. World **73**, 493 (1919).
- Manufacture of brass in the electric furnace. Electrochem. Met. Ind. **3**, 49 (1905).
- Melting of non-ferrous metals and alloys. Elec. World **73**, 1110-1114 (1919).
- Melting silver, nickel and bronze alloys by electricity. Eng. Min. J. **107**, 323-324 (1919).
- Miller, D. D. The electric furnace as a medium for heating non-ferrous metals. J. Am. Inst. Metals **11**, 257-281 (1917); Met. Chem. Eng. **17**, 537 (1917).
- Parry, W. H. Electric furnace for melting brass. Metal Ind. **14**, 152 (1916); C. A. **10**, 1617.
- Roeber, E. F. Manufacture of brass in the electric furnace. Electrochem. Met. Ind. **3**, 4 (1905).
- Ryan, F. J. Week's electric rotating furnaces as applied to the brass foundry practice. Metal Ind. **17**, 519-521 (1919).

- St. John, H. M. Detroit rocking furnace for melting brass and bronze. *Metal Ind.* **17**, 320-322 (1919).
- Electric brass melting from the central station viewpoint. *Trans. Am. Inst. Metals* **9**, 395-403 (1914); *Met. Chem. Eng.* **12**, 646-647 (1914); *C. A.* **8**, 3759.
- Electric brass melting—its progress and present importance. *Elec. J.* **16**, 373-380 (1919); *C. A.* **14**, 19.
- Present status of brass melting. *Chem. Met. Eng.* **19**, 321-328 (1918); *Elec. World* **71**, 1129-1131, 1216-18 (1918); *Iron Age* **101**, 1281 (1918); *C. A.* **12**, 1439.
- Schmelz, E. M. Electric furnace for medium temperatures. *Trans. Am. Inst. Metals* **8**, 261-266 (1914); *C. A.* **8**, 3758.
- Scott, E. K. The electric furnace for iron and brass foundries. *Rev. de l'ingenieur et index techn.*; *Rass. Min.* **39**, 207-208; *Foundry* **41**, 379-381 (1913); *C. A.* **8**, 867.
- Trend towards electric brass melting. *Met. Chem. Eng.* **18**, 434-435 (1918).
- Vickers, C. Electric brass furnace. *Foundry* **41**, 27-28 (1913).
- Witmer, A. S. Performance data on a brass melting furnace. *Elec. World* **72**, 891 (1918); *C. A.* **13**, 8.

### Copper.

- Addicks, L. Melting of cathode copper in the electric furnace. *Bull. Am. Inst. Min. Eng.* **96**, 2825 (1914).
- Borchers. Progress in refining and concentration in the metallurgy of copper; the simplification and diminution of their duration by the electric furnace. *Rev. métal* **7**, 1126-1128; *C. A.* **5**, 2369.
- Clamer, G. H. Electric furnace for copper alloys. *Foundry* **42**, 77, 80 (1914).
- Dewar, W. Electric smelting of copper ores. *Min. Mag.*, London, **16**, 288-294; *C. A.* **11**, 2431.
- Electric copper smelting furnace tried in Arizona. *Elec. Rev. West. Elec.* **63**, 636; *C. A.* **7**, 3713.
- Furnace for melting copper-zinc alloys (Ajax-Wyatt and Ajax-Northrup furnaces). *Foundry* **45**, 514-517 (1917); *C. A.* **12**, 1268.



- Haanel, E. Report of the commission appointed to investigate the different electrothermic processes for smelting of iron ores and the making of steel in operation in Europe. Canada Department of Interior, Mines Branch, 1909. pp. 215-223. Report by Vatier.
- Hansen, C. A. Electric smelting of copper and brass. Trans. Am. Inst. Metals 6, 110-129 (1912); C. A. 7, 937.
- Ladd, S. B. Electrical smelting of copper ores. Met. Chem. Eng. 8, 7-8 (1910); C. A. 4, 994.
- Lebeau, P. Copper silicide and the formation of silicon soluble in hydrofluoric acid. Compt. rend. 142, 154-157 (1906); J. Soc. Chem. Ind. 25, 187.
- Lyons, D. A. and Keeney, R. M. Melting cathode copper in the electric furnace. Bull. Am. Inst. Min. Eng. 92, 1791-1800; 96, 2825 (1914); Trans. 49, 724-734 (1914); C. A. 9, 755. The smelting of copper ores in the electric furnace. Bull. Am. Inst. Min. Eng. 80, 2117-2149. Trans. 47, 233 (1913); Met. Chem. Eng. 11, 522-527 (1913); C. A. 7, 3572; Discussion, Bull. 83, 2724; C. A. 8, 465; U. S. Bureau of Mines, Bulletin 81, 76 pp. (1915).
- Papencordt, P. Melting copper speiss in electric furnace. J. four elec. 28, 98-100; Metal Ind. 14, 502-504 (1919).
- Rauchenplat, G. von. Electric smelting of copper ore and by-products of copper metallurgy. Metallurgie 7, 151-155; C. A. 5, 1368.
- Richards, J. W. Metallurgical calculations. Electric smelting of copper ores. Electrochem. Met. Ind. 5, 496 (1907).
- Schilowski, I. Electric smelting of copper ores and of the intermediary products of the copper blast furnace. Rev. métal. 9, 205; Metallurgie 8, 617-625 (1912); C. A. 6, 977.
- Schmelz, E. M. Electric furnace for medium temperature. Trans. Am. Inst. Metals 8, 261-9 (1914); C. A. 8, 3758.
- Stephan, M. Production of copper and nickel in the electric furnace. Metall. u. Erz. 1, 11-17; Chem.-Ztg. 36, 1194; Met. Chem. Eng. 11, 22-23 (1913); C. A. 7, 730; C. A. 8, 2846.
- Vatier, C. Technical experiments on the smelting of copper ores in the electric furnace. Berg. u. Hüttenm. Z. 62, 549 (1903); J. Soc. Chem. Ind. 23, 25.



Vickers, Chas. Electric furnace as a copper melting medium. Foundry 45, 280-283 (1917); C. A. 11, 2431.

Wolkoff, W. Electric smelting of copper sulfate ores. Metallurgie 7, 99 (1910).

Wright, L. T. Behavior of copper slags in the electric furnace. Bull. Am. Inst. Min. Eng. 39, 221-222; C. A. 4, 1576.

Zeerleder, A. von. Smelting of copper-nickel sulfide ores in the electric furnace. Metall. u. Erz. 13, 453, 473, 494 (1916); C. A. 12, 118.

### Nickel.

Borchers, W. Electro-metallurgy of nickel. Monographien über angewandte Elektrochemie No. 6 (1903).

Electric smelting of nickel ore. Met. Chem. Eng. 8, 277; C. A. 4, 1844.

Electrometallurgical treatment of nickel minerals in New Caledonia. J. four elec. 24, 3 (1919); C. A. 13, 537.

Morrison, W. L. Electric furnace treatment of nickel ores and the development of a commercial process. Trans. Am. Electrochem. Soc. 20, 315-353 (1911); C. A. 6, 29.

Stephan, M. Production of metals in the electric furnace. Metall. u. Erz. 1, 11-17; Chem.-Ztg. 36, 1194; Met. Chem. Eng. 11, 22-23; C. A. 7, 730; C. A. 8, 2846.

Zeerleder, A. von. Smelting of copper-nickel sulfide ores in the electric furnace. Metall. u. Erz. 13, 453, 473, 494 (1916); C. A. 12, 118.

### Tin.

Electric tin smelting. Eng. Min. J. 97, 167-168; C. A. 8, 1061.

Escard, J. Electrometallurgy of tin in the electric furnace. Ind. Electrique 27, 444-448 (1918).

Harden, J. Electric tin melting. Met. Chem. Eng. 9, 453-457 (1911); C. A. 5, 3655.

Mattonet, F. Electric reduction of tin ore. Metallurgie 5, 186-191; C. A. 2, 1817.

Mennicke, H. Tin smelting—the electric vs. the reverberatory furnace. Mining J. 105, 531-2 (June 6, 1914).

Recent experiments in electrometallurgy of tin. J. four elec., Jan., 1912; Min. Eng. World 36, 868; C. A. 6, 2033.

Smelting tin dross in the electric furnace. *Brass World* **7**, 59-60 (1911); *C. A.* **5**, 1367.

Smelting of tin ore in the electric furnace. *Mining J.* **103**, 1002 (Oct. 18, 1913).

Wile, R. S. Electric furnace for the treatment of tin dross, concentrates from cyanide mills and other metallurgical work. *Met. Chem. Eng.* **10**, 495-496 (1912); *C. A.* **6**, 2889.

Reduction of tin dross in the electric furnace. *Met. Chem. Eng.* **8**, 629; *Chem. Eng.* **12**, 148; *Brass World* **6**, 386 (1910); *Trans. Am. Electrochem. Soc.* **18**, 205 (1910); *C. A.* **5**, 430.

Smelting of dross in the electric furnace. *Trans. Am. Electrochem. Soc.* **26**, 252-255 (1914); *Min. Eng. W.* **42**, 501-504 (1915); *C. A.* **9**, 1581.

### Zinc.

Attempts to produce zinc oxide electrochemically on an industrial scale. *Farben-Ztg.* **18**, 1059-1060; *C. A.* **7**, 1672.

Borchers, W. Treatment of sulfide or oxide zinc ores in the electric furnace. *Metallurgie* **9**, 153-154; *C. A.* **6**, 1570.

Brown, O. W. and Oesterle, W. F. Electric smelting of ores. *Trans. Am. Electrochem. Soc.* **8**, 171-180 (1905); *Electrochem. Met. Ind.* **3**, 378-379 (1905).

Busachi, Agostino. Dr. Gino Gallo's "Electrometallurgy of Zinc." *Rass. min.* **37**, 153-154; *C. A.* **7**, 26.

C. F. Application of the electric furnace in the extraction of zinc. *Rass. min.* **35**, 107; *C. A.* **5**, 3761.

Clerc, F. L. Smelting zinc in an electric furnace. *Met. Chem. Eng.* **11**, 428-429 (1913); *C. A.* **7**, 3454.

Electric zinc smelting. *Met. Chem. Eng.* **11**, 668 (1913); *C. A.* **8**, 867.

Condensation problem in electric zinc smelting. *Met. Chem. Eng.* **10**, 451 (1912).

Electric furnaces for manganese ores and zinc smelting furnaces. *Elec. Rev. West. Elec.* **73**, 218 (1918); *C. A.* **12**, 1856.

Electric furnace performance for alloys of high zinc content. *Elec. Rev.* **74**, 814-815 (1919); *C. A.* **13**, 1424.

Electric zinc furnaces. *Met. Chem. Eng.* **11**, 583-585 (1913).

- Electric zinc smelting. *Eng. Min. J.* **94**, 1109 (1912).
- Electric zinc smelting process. *Met. Chem. Eng.* **16**, 158-159. (1917).
- Electric zinc smelting in Norway and Sweden. *Met. Chem. Eng.* **9**, 673 (1911).
- Electrolytic zinc refining. *Chem. Trade J.* **58**, 363 (1916); *C. A.* **10**, 1813.
- Electrometallurgy of zinc. *Elec. Rev. (London)* **73**, 408-409 (Sept. 12, 1913).
- Extracts from the technical literature on steel and zinc. *Z. Elektrochem.* **22**, 305-314 (1916); *C. A.* **11**, 1363.
- Ferraris, Em. Zinc problem in Italy. *J. four elec.* **27**, 182 (1918).
- FitzGerald, F. A. J. Electric furnace for zinc smelting. *J. Ind. Eng. Chem.* **3**, 417-419 (1911); *Min. World* **34**, 929-930; *Min. Sci. Press* **63**, 515-518; *C. A.* **5**, 2369.
- Radiant resistor furnace. *Chem. Met. Eng.* **21**, 737-739 (Dec. 10-17, 1919).
- Fleurville, Eugene. Electric zinc smelting. *La Houille Blanche* **7**, 273; *Electrochem. Met. Ind.* **7**, 468 (1909); *C. A.* **4**, 147.
- Flusin, G. Recent developments of the Cote and Pierron electric zinc smelting process. *Bull. Tech. de la Suisse Romande* **43**, 233 (1917); *Met. Chem. Eng.* **18**, 17 (1918); *C. A.* **12**, 790.
- Fulton, C. H. Electrical resistance furnace of large capacity for zinc ores. *Bull. Am. Inst. Mining Met. Eng.* **153**, 2159-2195 (1919); *C. A.* **13**, 3084.
- Electric resistance furnace of large capacity for zinc ore. *Chem. Met. Eng.* **22**, 73-79 (1920); Operation of furnaces and characteristics of the process. *Ibid.* **22**, 130-135 (1920).
- Fulton's electric zinc furnace. *Met. Chem. Eng.* **18**, 539-540 (1918); *C. A.* **12**, 2166.
- Gallo, Gino. Electrometallurgy of zinc. *Gazz. chim. Ital.* **43**, I, 361-385; *Rass. min.* **37**, 57-62, 101-103; *C. A.* **6**, 3362.
- Gin, G. Electrometallurgy of zinc. *Trans. Am. Electrochem. Soc.* **12**, 117-139 (1908); *C. A.* **2**, 1526.

- Haanel, E. Electric furnace for the reduction of spelter. *Can. Dept. Mines, Bull.* **3** (1910); *C. A.* **5**, 249.
- Harbord, F. W. Zinc smelting at Trollhattan. *Eng. Min. J.* **93**, 344 (1912).
- Zinc smelting in electric furnaces. *Can. Eng.* **22**, 330-331; *C. A.* **6**, 977.
- Hess, J. Electrometallurgy of zinc. *Z. Elektrochem.*, Sept. 2, 23, 1904.
- Ingalls, W. R. Electric zinc smelting. *Chem. Eng.* **20**, 38-41; *Trans. Am. Electrochem. Soc.* **25**, 169-178 (1914); *C. A.* **9**, 890.
- Progress in the electric smelting of zinc ores. *Min. Eng. World* **37**, 58-60; *Eng. Min. J.* **94**, 7-10; *Met. Chem. Eng.* **10**, 481 (1912); *Trans. Can. Min. Inst.* **15**, 101 (1912); *C. A.* **6**, 589, 2578.
- Progress in metallurgy of zinc in 1906. *Eng. Min. J.* **83**, 20-21 (1907); *C. A.* **1**, 548.
- Johansson, E. A. Electric furnaces for zinc reduction. *Met. Chem. Eng.* **18**, 654 (1918).
- Johnson, Chas. F. The (Johnson) electric zinc smelting furnace. *Met. Chem. Eng.* **10**, 281-283 (1912); *C. A.* **6**, 2578.
- Johnson, W. M. By-products in electric zinc smelting. *Min. Eng. World* **39**, 1157-1159.
- Commercial aspects of electric zinc-lead smelting. *Trans. Can. Min. Inst.* **17**, 107-121; *C. A.* **9**, 3171.
- Electric zinc smelting—chemistry and operation of the Johnson continuous furnace. *Eng. Mag.* **48**, 268-270 (1914).
- Electric zinc smelting. *Trans. Am. Electrochem. Soc.* **24**, 191-214 (1913); *Met. Chem. Eng.* **11**, 582 (1913); *C. A.* **7**, 3713; *Min. Eng. W.* (Dec. 18, 1913).
- Electrometallurgy of zinc and its relation to present practice. *Trans. Am. Electrochem. Soc.* **11**, 265-277 (1907); *C. A.* **2**, 57.
- Notes on electric zinc smelting. *Met. Chem. Eng.* **10**, 537-538 (1912); *C. A.* **6**, 3361.
- Zinc smelting in the electric furnace. *Eng. Min. J.* **96**, 965-966; *Min. Eng. World* **39**, 1073-1075; **40**, 48-49; *Sci. Am. S.* **77**, 66-67 (1914).



- Johnson continuous electric zinc furnace. *Iron Age* **89**, 1082-3 (May 2, 1912).
- Keeney, R. M., and Lyon, D. A. Possible application of the electric furnace to western metallurgy. *Trans. Am. Electrochem. Soc.* **24**, 119-166 (1913); *Met. Chem. Eng.* **11**, 577 (1913).
- Kowalke, O. L. Volatility of zinc oxide. *Trans. Am. Electrochem. Soc.* **21**, 557 (1912).
- Lawrie, J. H. Electric furnaces for the treatment of zinc ores. *Min. Eng. World* **35**, 283-285 (1911); *C. A.* **6**, 1402.
- Lordier, C. V. Zinc electrometallurgy (dry). *Met. et alliages* **7**, No. 12, 1 (1914); *C. A.* **9**, 557.
- Louvrier, F. Cause of the practical non-success of the electric furnace in treating zinc ores. *Met. Chem. Eng.* **10**, 747-749 (1912); *C. A.* **7**, 1672.
- Electric zinc smelting. *Met. Chem. Eng.* **11**, 603; *C. A.* **8**, 867.
- Moulden, J. C., and Harbord, F. W. Electric smelting of zinc-lead ores at Sarpsborg, Norway, and at Trollhattan, Sweden. *Chem. Eng.* **14**, 510; *C. A.* **6**, 964.
- Nathusius, H. Electrochemical production of zinc. *Metall. u. Erz.* **15**, 87-93, 108-111 (1918); *C. A.* **12**, 2495.
- Offerhaus, C. Zinc made in the electric furnace. *Electrochem. Met. Ind.* **3**, 54 (1905).
- Peters, F. Developments in the electrometallurgy of zinc and cadmium. *Glückauf.* **45**, 1401-1413.
- Recent developments in the electrometallurgy of zinc. *Eng. Min. J.* **89**, 1017-1019; *C. A.* **4**, 1713.
- Peterson, Peter E. Electric furnace for zinc smelting. *Min. Eng. World* **38**, 1035-1039; **39**, 303-304, 549-550; *Chem. Eng.* **18**, 100-107; *C. A.* **7**, 3453, 3572, 3922.
- Electric zinc furnace. *Trans. Am. Electrochem. Soc.* **24**, 215-239 (1913); *Met. Chem. Eng.* **11**, 583 (1913); *Can. Eng.* (Sept., 1913).
- Production of metals (especially zinc) in the electric furnace. *J. four elec.* (1916), 109-112; *C. A.* **11**, 1363.

Richards, J. W. The Johnson electric zinc furnace. *Trans. Am. Electrochem. Soc.* **19**, 311-315 (1911) *C. A.* **5**, 3377.

Salgues, A. The electrometallurgy of zinc. *Mem. Soc. Ing. Civ. de France*, July, 1903.

Sartori, F. Experiments on the electrothermic treatment of zinc minerals. *Rass. min.* **15**, No. 5; *C. A.* **5**, 3656.

Snyder, F. T. Condensation of zinc vapors from electric furnaces. *Trans. Am. Electrochem. Soc.* **19**, 317 (1911); *Chem. Eng.* **13**, 209; *Met. Chem. Eng.* **9**, 265 (1911); *C. A.* **5**, 3378. The electric smelting of zinc ores. *Can. Min. Rev.* **25**, 83-87 (Oct., 1905).

Electric zinc smelting. *Min. Sci. Press.* **95**, 720 (1907); *C. A.* **2**, 394.

Stephan. Production of metals in the electric furnace. *Chem.-Ztg.* **36**, 1194; *C. A.* **8**, 2846.

Thomson, J. Condensation in electric zinc smelting. *Chem. Met. Eng.* **19**, 62-63 (1918).

Zinc in the electric furnace. *Metal Ind.* **3**, 209-210 (1905).

#### MISCELLANEOUS METALS.

Baskerville, Charles. Extraction of thoria. *Orig. Com. 8th Intern. Congr. Appl. Chem.* **2**, 17-19; *J. Ind. Eng. Chem.* **4**, 821 (1912); *Chem. News* **106**, 271; *C. A.* **7**, 306.

Betts, A. G. Electric lead smelting. *Electrochem. Met. Ind.* **4**, 168-173 (1906).

Blanquier, Juan. Electrometallurgy of aluminum. *Bol. soc. nacional minera Chile*; *C. A.* **9**, 557.

Bleecker, W. F. An electrolytic method for the reduction of blue powder. *Trans. Am. Electrochem. Soc.* **21**, 359 (1912).

Carothers, J. N. Electric furnace smelting of phosphate rock and the use of the Cottrell precipitator in collecting the volatilized phosphoric acid. *J. Ind. Eng. Chem.* **10**, 35-36, 239 (1918); *C. A.* **12**, 451, 652.

- Electric smelting of manganese ores. *Elec. Eng.* **52**, No. 5, 26, (1918); *C. A.* **13**, 8.
- Gillett, H. W., and James, G. M. Melting aluminium chips. Bureau of Mines, Bulletin 108, 1916.
- and Williams, C. E. Electric smelting of domestic ores. Bureau of Mines, War Minerals Investigating Series, Bull. **10** (1918); *C. A.* **13**, 1561.
- Gin, G. Electrochemistry of the rare metals. I. Molybdenum. *Trans. Am. Electrochem. Soc.* **12**, 411-474 (1907); *C. A.* **2**, 1781.
- Harden, J. Utilization of manganese ores in Sweden. *Met. Chem. Eng.* **17**, 701-704 (1917); *Iron Age* **101**, 938-940 (1918).
- du Jassonneix, Binet. Reduction of chromium oxide by boron. *Compt. rend.* **143**, 897; *C. A.* **1**, 527.
- Reduction of molybdenum dioxide by boron. *Compt. rend.* **143**, 169-172 (1906); *J. Soc. Chem. Ind.* **25**, 855.
- Keeney, R. M. Electric smelting of chromium, tungsten, molybdenum and vanadium ores. *Trans. Am. Electrochem. Soc.* **24**, 167-191 (1913); *C. A.* **7**, 3713.
- Lass, W. P. Electric furnace for gold refining at the Alaska Treadwell cyanide plant. *Bull. Am. Inst. Min. Eng.* 1915, 1443-1450; *Trans.* **52**, 171-179 (1915); *C. A.* **9**, 2737.
- Lehner, C. Preparation of molybdenum in electric furnace. *Metallurgie*, Aug. 22, 1906.
- Miller, D. D. Remelting of aluminium in the electric furnace. *Chem. Met. Eng.* **19**, 251-254 (1918); *C. A.* **12**, 2494.
- Muller, Peter. Titanium and metal sulfides. *Metallurgie* **7**, 537-39; *C. A.* **5**, 59.
- Nordenskjold, I. Production and properties of tantalum. *Tekn-Tidskrift*, Stockholm, 1905, 26-28; *Proc. Inst. Civil Eng.* **162**, 39-40 (1905); *J. Soc. Chem. Ind.* **25**, 79.
- Small Hellberger furnace for melting platinum. *Brass World* **8**, 273 (1912); *C. A.* **7**, 574.
- Silicomanganese furnace production record. *Chem. Met. Eng.* **21**, 752 (1919).

## ABBREVIATIONS USED.

Am. Electrician . . . . .	American Electrician
Am. Found. Assn. Trans....	American Foundryman's Association, Transactions
Am. Mach.....	American Machinist
Ann. Soc. Ing. Arch. Ital.....	Annali della Societa degli Ingegneri e degli Architetti Italiani
Appl. Sci. ....	Applied Science
Assoc. Iron Steel Elec. Eng...	Association of Iron and Steel Electrical Engineers
Atti incoraggiamento Napoli..	Atti del r. istituto d'incoraggiamento di Napoli
Aust. Min. Stand.....	Australian Mining Standard
Automotive Eng.....	Automotive Engineer
Automotive Ind.....	Automotive Industries
Berg. u. Hüttenm. Z.....	Berg und Hüttenmännische Zeitschrift
Blast Furnace.....	Blast Furnace and Steel Plant
Bol. soc. nacional minera Chile.	Boletin de la sociedad nacional de minera de Chile
Bull. Am. Inst. Min. Eng.....	Bulletin of the American Institute of Min- ing Engineers
Bull. Am. Inst. Mining Met. Eng. ....	Bulletin of the American Institute of Min- ing and Metallurgical Engineers
Bull. Can. Min. Inst.....	Bulletin of the Canadian Mining Institute
Bull. sci. Liège .....	Bulletin scientifique, Liège
Bull. soc. inter. elec.....	Bulletin de la Société Internationale d'Elec- triciens
Bull. tech. de la Suisse Ro- mande.....	Bulletin technique de la Suisse Romande
Bureau Mines Tech. Paper....	Bureau of Mines Technical Papers
C. A. ....	Chemical Abstracts
Can. Chem. J.....	Canadian Chemical Journal
Can. Dept. Mines, Bull.....	Canadian Department of Mines, Bulletin
Can. Elec. News.....	Canadian Electrical News
Can. Eng.....	Canadian Engineer, The
Can. Foundryman.....	Canadian Foundryman
Can. Machy.....	Canadian Machinery
Can. Min. J.....	Canadian Mining Journal, The
Can. Min. Rev.....	Canadian Mining Review
Can. Soc. Civ. Engrs.....	Canadian Society of Civil Engineers
Cassier's Mag. ....	Cassier's Magazine
Chem. App. ....	Chemische Apparatur
Chem. Eng. ....	Chemical Engineer, The
Chem. Ind.....	Chemische Industrie, Die
Chem. Met. Eng.....	Chemical and Metallurgical Engineering
Chem. News .....	Chemical News
Chem. Trade J. ....	Chemical Trade Journal and Chemical En- gineer
Chem. World .....	Chemical World
Chem.-Ztg. ....	Chemiker-Zeitung
Col. School Mines Mag.....	The Colorado School of Mines Magazine
Compt. rend. ....	Comptes rendus hebdomadaires des séances de l'académie des sciences



Durham Phil. Soc.....	Durham Philosophical Society
Elec. Eng. ....	Electric Engineering
Elec. J. ....	Electrical Journal
Elec. News ....	Electrical News
Elec. Rev. ....	Electrical Review
Elec. Rev. West. Elec.....	Electrical Review and Western Electrician
Elec. Times.....	Electric Times
Elec. World ....	Electrical World
Elecn. ....	Electrician, The
L'Elecn. ....	L'Electricien
Electrochem. & Met.....	Electrochemist and Metallurgist
Electrochem. Ind.....	Electrochemical Industry
Electrochem. Met. Eng.....	Electrochemical and Metallurgical Engineering
Electrochem. Met. Ind.....	Electrochemical and Metallurgical Industry
Elek. Kraft. u. Bahnen.....	Elektrische Kraftbetriebe und Bahnen
Elektrochem. Z.....	Electrochemische Zeitschrift
Elektrotech. u. Polytech. Rundschau.....	Elektrotechnische und Polytechnische Rundschau
Elektrotech. Z.....	Elektrotechnische Zeitschrift
Eng. ....	Engineer
Eng. Mag. ....	Engineering Magazine
Eng. Min. J.....	Engineering and Mining Journal
Eng. News ....	Engineering News
Eng. Rev. ....	English Review
Eng. Soc. W. Penn., Proc.....	Engineers' Society of Western Pennsylvania, Proceedings
Farben-Ztg. ....	Farben-Zeitung
Foundry Trade J.....	Foundry Trade Journal
Gazz. chim. ital.....	Gazzetta chimica italiana
Gen. Elec. Rev.....	General Electric Review
Génie C.....	Génie Civil
Giesserei Zeit.....	Giesserei Zeitung
Glaser's Ann.....	Glaser's Annalen
Glückauf ....	Glückauf, Berg-und Hüttenmännische Zeitschrift
L'ind. chim. min. met.....	L'Industria chimica, mineria e metallurgica
Ind. électrique.....	Industrie électrique
Ind. Eng. ....	Industrial Engineering
Ind. Management ....	Industrial Management
Inst. E. E. J.....	Journal of the Institution of Electrical Engineers
Inst. Min. Met.....	Institute of Mining and Metallurgy
Intern. Cong. Appl. Chem.....	International Congress of Applied Chemistry
Iron Coal Trades Rev.....	Iron and Coal Trades Review
Iron Steel Mag.....	Iron and Steel Magazine
Iron Trade Rev.....	Iron Trade Review, The
J. Am. Inst. Metals.....	Journal of the American Institute of Metals
J. Am. Steel Treathers' Soc.....	Journal of the American Steel Treathers' Society
J. Can. Min. Inst.....	Journal of the Canadian Mining Institute

- J. Chem. Met. Soc. S. Africa.. Journal of the Chemical, Metallurgical and Mining Society of South Africa  
 J. Chem. Soc..... Journal of the Chemical Society  
 J. Clev. Eng. Soc..... Journal of the Cleveland Engineering Society  
 J. Elec..... Journal of Electricity  
 J. Elec. Power Gas..... Journal of Electrical Power and Gas  
 J. d'Electrolyse ..... Journal de L'electrolyse et du four electrique  
 J. Eng. Club, Phila..... Journal of the Engineers' Club of Philadelphia  
 J. Eng. Club, St. Louis..... Journal of the Engineers Club of St. Louis  
 J. four elec..... Journal du four electrique et de l'electrolyse  
 J. Franklin Inst ..... Journal of the Franklin Institute  
 J. Ind. Eng. Chem..... Journal of Industrial and Engineering Chemistry  
 J. Iron Steel Inst..... Journal of the Iron and Steel Institute  
 J. Royal Soc. Arts..... Journal of the Royal Society of Arts  
 J. Russ. Chem. Soc..... Journal of the Russian Chemical Society  
 J. Soc. Chem. Ind..... Journal of the Society of Chemical Industry  
 J. West. Scotland Iron and Steel Inst. .... Journal West of Scotland Iron and Steel Institute  
 J. West. Soc. Engineers..... Journal of the Western Society of Engineers  
  
 Lumière elec. .... La Lumière Electrique  
  
 Mach ..... Machinery  
 Manuf. Rec. .... Manufacturers Record  
 Mech. Eng. .... Mechanical Engineering  
 Mem. soc. ing. civ. de France. Memoirs de la Société des Ingenieurs Civils de France  
 Met. et alliages..... Metaux et alliages  
 Met. Chem. Eng..... Metallurgical and Chemical Engineering  
 Met. italiana ..... Metallurgia italiana, La  
 Metal Ind. .... Metal Industry  
 Metall. u. Erz..... Metall und Erz. Zeitschrift für Metallhüttenwesen und Erzbergbau  
 Min. Eng. World..... Mining Engineering World  
 Min. Ind. .... Mining Industry  
 Min. Mag. .... Mining Magazine  
 Min. Sci. .... Mining Science  
 Min. Sci. Press..... Mining and Scientific Press  
 Min. World ..... Mining World  
 Mining J. .... Mining Journal  
 Mitt. kgl. Materialprüfungsamt ..... Mitteilungen aus dem königlichen Materialprüfungsamt zu Berlin Lichterfelde West  
 Mon. Sci. .... Moniteur scientifique du Docteur Quesneville  
 Monit. tecn. .... Moniteur Tecnico  
 Montan. Rundsch. .... Montanistische Rundschau  
  
 Oesterr. Chem. Ztg. .... Oesterreichische Chemiker Zeitung  
 Oesterr. Z. Berg. Hüttenw..... Oesterreichische Zeitschrift für Berg und Hüttenwesen

Phys. Rev. ....	Physical Review, The
Proc. Am. Inst. E. E. ....	Proceedings of the American Institute of Electrical Engineers
Proc. Am. Inst. Metals. ....	Proceedings of the American Institute of Metals
Proc. Eng. Club, Phila. ....	Proceedings of the Engineers' Club of Philadelphia
Proc. Inst. Civil Eng. ....	Proceedings of the Institution of Civil Engineers
Proc. Inst. Metals, London. . .	Proceedings of the Institute of Metals
Rass. min. ....	Rassegna mineraria, metallurgica e chimica
Rev. chim. ind. ....	Revue de chimie industrielle
Rev. d'électrochim. ....	Revue d'électrochimie et d'electrometallurgie
Rev. gén. chim. ....	Revue générale de chimie pure et appliquées
Rev. gén. sci. ....	Revue générale des sciences pures et appliquées
Rev. industriel ....	Revue industrielle
Rev. de l'ingenieur et index techn. ....	Revue de l'ingenieur et index technique
Rev. metal. ....	Revue de Métallurgie
Riv. marit. ....	Rivista Marittima
Rivista tecnica d. ferr. ital. ....	Rivista tecnica della ferroire Italiana
Roy. Soc., Phil. Trans. ....	Royal Society of London, Philosophical Transactions
Ry. Age ....	Railway Age
Schweiz. Bau. ....	Schweizerische Bauzeitung
Sci. Am. S. ....	Scientific American Supplement
Sibley J. Eng. ....	Sibley Journal of Engineering
Stahl u. Eisen. ....	Stahl und Eisen
Tec. mod. ....	La Technique Moderne
Tech. Paper ....	Technical Papers
Trans. Am. Brass Founders' Assn. ....	Transactions of the American Brass Founders' Association
Trans. Am. Electrochem. Soc. ....	Transactions of the American Electrochemical Society
Trans. Am. Inst. Chem. Eng. ....	Transactions of the American Institute of Chemical Engineers
Trans. Am. Inst. E. E. ....	Transactions of the American Institute of Electrical Engineers
Trans. Am. Inst. Metals. ....	Transactions of the American Institute of Metals
Trans. Am. Inst. Min. Eng. ....	Transactions of the American Institute of Mining Engineers
Trans. Can. Min. Inst. ....	Canadian Mining Institute, Transactions
Trans. Eng. Soc. Toronto. ....	Transactions of the Engineering Society of Toronto
Trans. Faraday Soc. ....	Transactions of the Faraday Society
Trans. Inter. Eng. Congress. ....	Transactions of the International Engineering Congress
U. S. Bur. Standards Bull. ....	United States Bureau of Standards, Bulletin

W. Engineering .....	Western Engineering
W. Soc. Eng. J. ....	Western Society of Engineers, Journal
West. Chem. Met.....	Western Chemist and Metallurgist
Wis. Engr. ....	Wisconsin Engineer
Z. angew. Chem. ....	Zeitschrift für angewandte Chemie
Z. d. Oest. Ing. u. Arch. Ver...	Zeitschrift des Oesterreichischen Ingenieur- und Architekten Vereines
Z. Elektrochem. ....	Zeitschrift für Elektrochemie
Z. Ver. deut. Ing.....	Zeitschrift des Vereines Deutscher Inge- nieure















THIS BOOK IS DUE ON THE LAST DATE  
STAMPED BELOW

AN INITIAL FINE OF 25 CENTS  
WILL BE ASSESSED FOR FAILURE TO RETURN  
THIS BOOK ON THE DATE DUE. THE PENALTY  
WILL INCREASE TO 50 CENTS ON THE FOURTH  
DAY AND TO \$1.00 ON THE SEVENTH DAY  
OVERDUE.

SEP 18 1932

DEC 19 1934  
AUG 31 1935

DEC 27 1941

APR 6 1944

662527

TN682  
W4

UNIVERSITY OF CALIFORNIA LIBRARY

